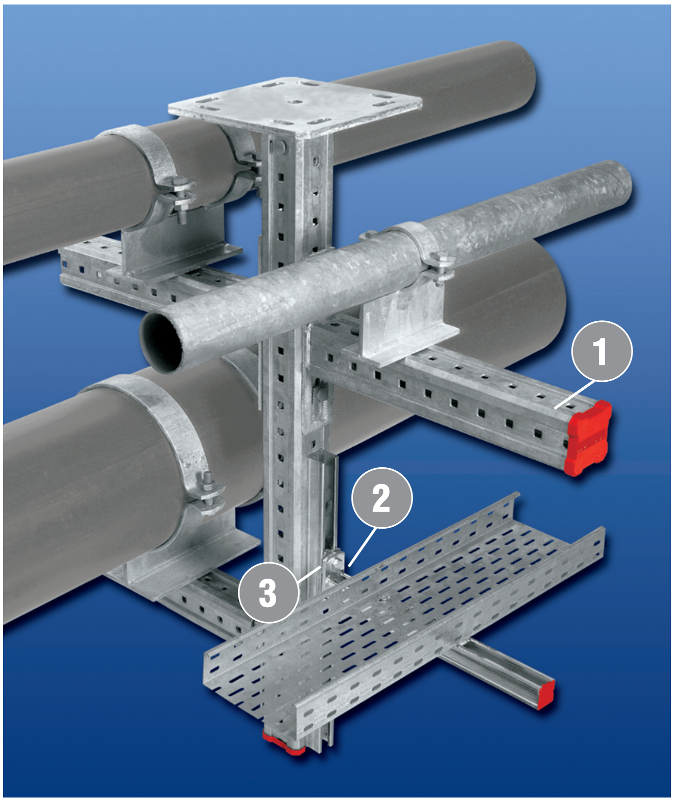
Technical data

Cover a wide range of loads with the Hilti MI and MQ systems!



1 MI System

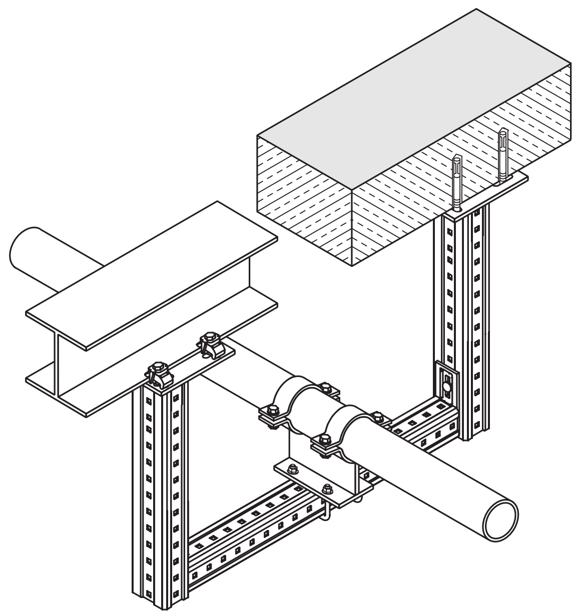
The modular pipe support system for medium to heavy loads without welding: easy to install and absolutely dependable, the Hilti MI System is the ideal solution for pipes of up to 600 mm in diameter. Specially designed to take up loads in the horizontal plane (torsion).

2 MQ System

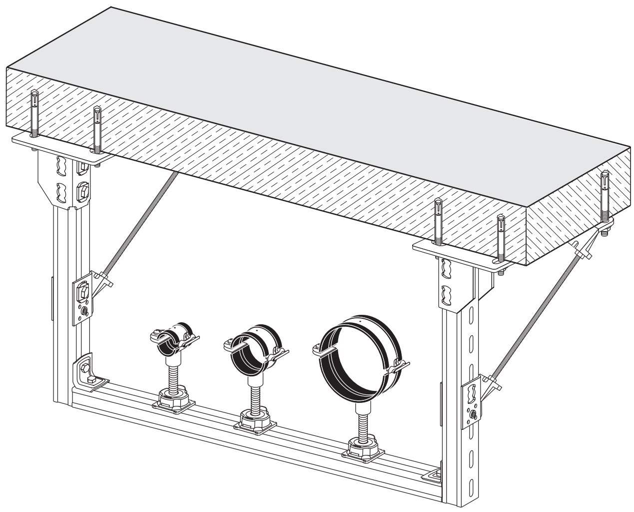
The well-proven Hilti MQ System for loads in the medium range is the versatile extension of the MI System. Ideal for installing pipes and cable trays.

3 The right connection

With the strength of welded structures but much more efficient: a patented, longitudinal swaged indentation ensures easy modular combination of the two systems. The precise fit of the girders and channels allows loads to be taken up optimally and eases installation.



MI System

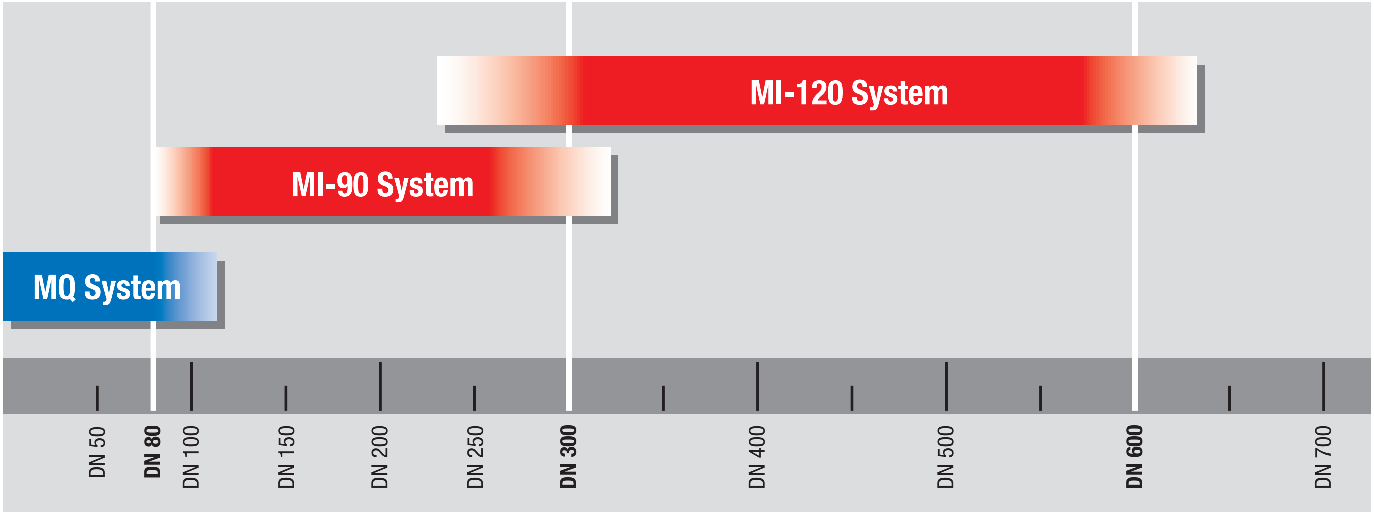


MQ System

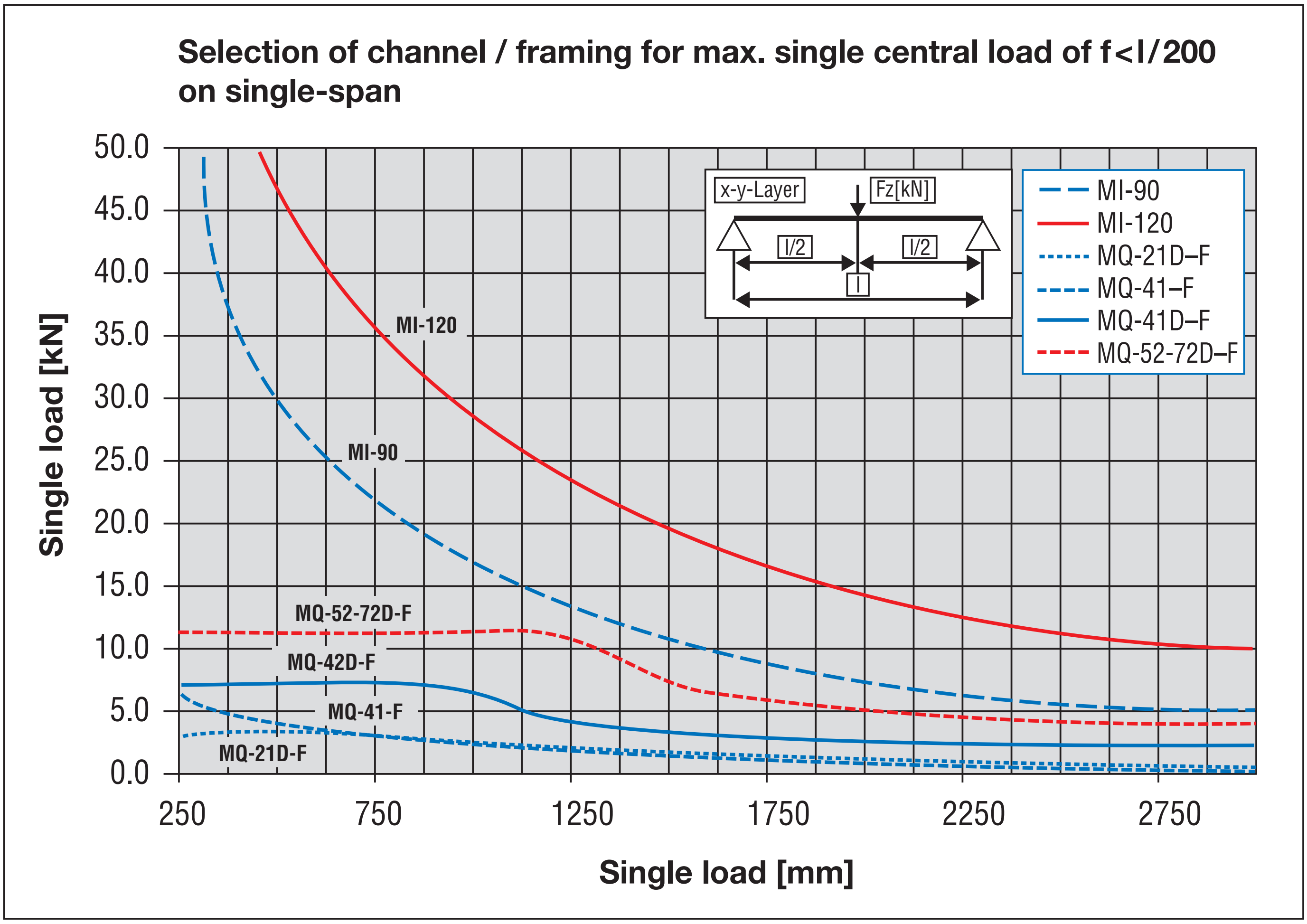
Cover a wide range of loads with the Hilti MI and MQ systems! Selection aids for channels and girders

Two selection aids are available to assist users to find the most suitable Hilti system:

1. Selection according to nominal size



2. Selection according to load



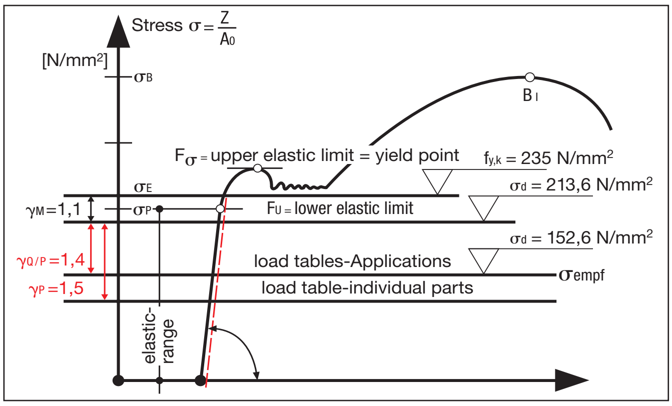
Introduction to the MI and MQ systems

The subsequently listed loading tables and diagrams for individual parts and applications for the MI and MQ systems are based on the following:

– DIN 18800 parts 1 – 3 “Steel Construction”, dated 1990
– DAST guideline 016 “The calculation and design of supporting structures made from light-gauge, cold-formed metal components”, dated 1992
– “The dimensioning of light-gauge cross-sections in steel construction” by Prof. Dr. Carl Roik
– Statics lecture notes from Prof. Dr. Schineis of the University of Munich.

The basic design principles in Eurocode EC3 are similar and are based to a great extent on the regulations published in DIN 18800. All verification calculations take the partial safety factors into account.

Safety factors



Resistance: γ_M = 1.1 (s.DIN 18800T1.)
Action: γ_Q = 1.5 (for all individual parts)
Action: $\gamma_{G/Q}$ = 1.4 (for all applications such as design calculations for girders / channels, cantilevers, joints, U-frames and Lorraine cross).

The design values for individual parts are thus increased by the factor 1.5 and for applications by the factor 1.4.

Reason

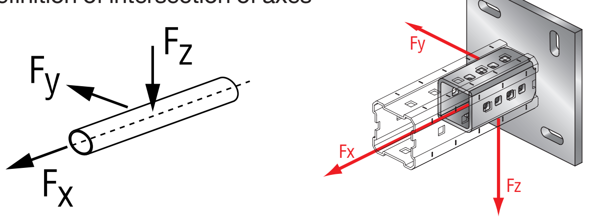
a) γ_Q = 1.5 (for all individual parts)
As it is not known exactly how individual parts will be used in each application, the least favorable, possible safety factor – on the safe side – is selected.

b) $\gamma_{G/Q}$ = 1.4 (for all applications such as design calculations for girders / channels, cantilevers, joints, U-frames and Lorraine cross).

The subsequently listed tables apply, above all, to pipe support applications. The scatter band of the load applied by the medium carried (usually water or some other liquid) is normally very low.

1) Load tables for individual parts

Definition of intersection of axes



x-axis = bar axis (individual parts –> girders; applications –> pipe axis)
y-axis = horizontal or weak axis of frame
z-axis = vertical or strong axis of frame

The load values, as far as possible, have been determined analytically.

a) Plate thickness: finite elements program; plate with welded-on girder, position of anchors or beam clamps adjustable in elongated holes.

b) The MI-GC-M12 beam clamp has been designed as an ideal means of rigid fastening. The recommended max. shear load on these clamps depends on the applicable stress (see load table). The clamps must always be used in pairs. The base material is defined (hot-dip galvanized on hot-dip galvanized). The recommended max. shear load can be lower on painted surfaces. In case of doubt, tests should be carried out to determine the applicable max. shear load. The base material must be clean and free from oil and grease. The beam clamps are **not suitable for dynamic loading or situations where subjected to vibration.**

c) Calculations are based on the use of HST, HVZ, HIT-TZ, HDA or HSL anchors of the M12 or M16 size, depending on the type of plate (see load table). The other general conditions (e.g. concrete strength, thickness , etc.) should be taken from the applicable approvals or national regulations.

d) Bolting the inner tubular section to the girder: Two bolts should be fitted crosswise at each joint. In order to avoid hole elongation, the minimum edge distance in the direction of load application – unless otherwise stated – is 25 mm. The bolts should be pretensioned to a torque of 84 Nm. In some cases, a significantly higher load value can be achieved, above all in the area where the moment is applied, by using 3 bolts. Technical advice should be requested in order to clarify when and how this can be done.

e) Factors such as bolts in the outermost positions on MI girders (e.g. cantilevers): the most unfavorable position of bolts (e.g. at greatest possible distance) have been taken into account. Tests have also been carried out to verify load values for toothed connections.

f) Permissible moments have been limited by way of tests so that, with a fixture such as a cantilever, the value l / 150 of the design value or load multiplied by the factor g is not exceeded. Where greater deformation is permissible, these values may be exceeded after prior consultation, e.g. with our technical consultants.

2) Load tables for applications

The vertical loads result from the pipe’s own weight incl. insulation and the pipe clamp or support (pipe ring, saddle, sliding support, etc.) on the girder.

Forces resulting from pipe expansion must be taken into account during planning. Where the loads induced by pipes or pipe supports cause friction between the steel surfaces with a coefficient of friction of μ = 0.3, this can be reduced by fitting low-friction inserts.

Introduction to the MI and MQ systems

The recommended max. load values given in the tables assume use of the MIC-PG low friction insert with a coefficient of friction of μ = 0.15.
The values in the tables indicate the applicable load at the support and thus do not require other special consideration.

The Hilti anchor fastening design and selection aids also take a safety factor $\gamma_{G/Q}$ of 1.4 into account and thus permit rapid selection of the suitable anchor.

Verification itself was carried out at the level of the design load values (Fd) so that planners are in a better position to estimate the necessary safety factor, even in special cases.

a) Single spans and cantilevers: The figures in the tables apply to purely vertical loading or, where indicated, also to horizontal loads. Due to the high torsional rigidity of the girders (MI 90 and MI 120) the resulting increase in tensile stress or twisting is insignificant (less than 1°). Other extreme torsional loads must also be verified.

b) Buckling: The buckling load table applies to central buckling loads according to Euler's formula $\alpha = 1$. Additional moments resulting from offsetting, angles or other types of loading must be taken into consideration in design calculations.

c) U-frame: All individual parts have been verified. The assembled supports can take up loads (e.g. longitudinal expansion of the pipes) in the x- or y-axis, e.g. at the corner connectors (fastened with MIC-S90-AA or with MIC-C90-AA only in x-axis). When items are fastened to steel beams with an open profile (e.g. double-T, U-profile or angle), it must be remembered that beams of this type have only limited torsional rigidity and can twist very easily. Additional structural measures are necessary (e.g. additional parallel framing, braces, struts, etc.) in order to avoid twisting. The fastening materials such as beam clamps and anchors have been verified. Care must be taken to ensure that forces are taken up correctly in the base material.

d) Lorraine cross (see c): Where loading is asymmetrical, it may not be possible to take up additional horizontal loads in the y-axis (e.g. at the corner connector) in every case in accordance with the values given in the table.
Additional verification is necessary. Bracing as described at c) increases loadbearing capacity considerably.

3) General points

a) Reusability of components from the Hilti MI System
The reuse of components from the Hilti MI System is basically possible as long as the following conditions are checked and observed in each case before reuse:
- The components must not show any signs of damage such as deformation or cracking.
- The components must not have been subjected to inadmissible loads during previous applications.
- The corrosion protection on MI System components must be undamaged and must meet the demands of the new application.
- Low-friction inserts (MIC-PG) that show clear signs of wear should not be reused.
- In order to avoid assembly errors, the personnel carrying out the work must have read the installation instructions (available at: *www.hilti.com/SystemMI*).
  Original Hilti connecting parts (bolts, nuts, etc.) must be used.
- Re-use of MI nuts is not permissible as security of the self-locking function can no longer be ensured.
- In order to avoid damage to the components, structures should be dismantled only by suitably trained personnel.

The user carries responsibility for ensuring that these points are observed.

Even if only one of these prerequisites is not fulfilled, the corresponding parts should not be re-used.

b) Fastening, taking up loads in base material, corrosion protection
Fastening by way of beam clamps and anchors has been verified. Verification that the recommended loads for individual MI components and MI applications are taken up correctly by the base material (steel, concrete, etc.) is to be provided by those responsible for the building project. The surfaces of components are hot-dip galvanized. Other corrosion-protection coatings are available on request.

c) Area of applications
The MI System is designed for installations in compliance with the requirements of the European standard EN 13480 for industrial metal pipe systems.

Objectives

The tables and diagrams serve as an orientation aid to supplement the Hilti channel installation system design program and should be used as rapid selection aids for the design calculation process.

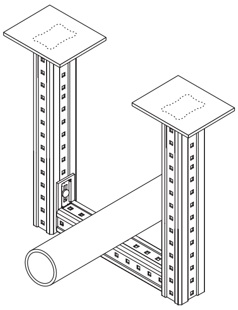
As long as the actual static systems installed are similar to or present even more favorable characteristics than those listed here, no further static verification is required.

Important note: Great care was taken in the preparation of these tables and diagrams and the results checked several times. The possibility of errors, however, cannot be excluded. These tables and diagrams are intended purely as an aid to the user and no guarantee can be given regarding their correctness or accuracy when used for design calculations for a specific application. Should you, despite the care we have taken, discover an error in the information given here, please notify us accordingly. In any event, the static system or, respectively, the specific application must always be checked for plausibility by the user.

MI System applications - connections to steel

MI System applications - connections to concrete

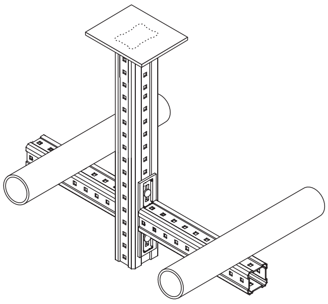
U-frame structures



Medium - heavy duty
MIC-C90-AA
MIC-C90-D
MIC-C90-D with 3 bolts 5.38 - 5.41

Heavy - maximum duty
MIC-C120-D
MIC-C120-D with 3 bolts 5.42 - 5.43

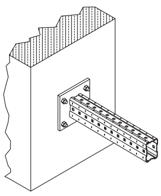
Lorraine cross without bracing

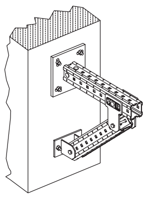


Medium - heavy duty
MIC-C90-D
MIC-C90-D welded bracket 5.44 - 5.46

Heavy - maximum duty
MIC-C120-D
MIC-C120-D welded bracket 5.47 - 5.48

Cantilevers





Cantilevers on concrete structures
MI-90 / 120

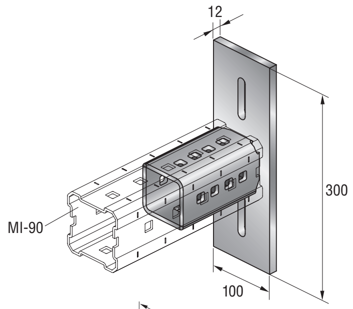
Cantilevers on concrete structures
MI-90 – welded

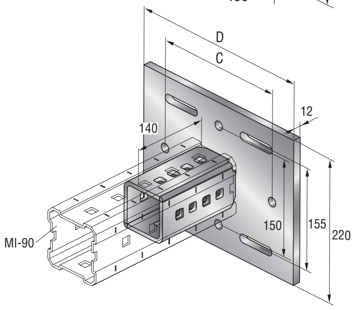
Cantilevers on concrete structures
MI-120 – welded 5.49 - 5.50

General points

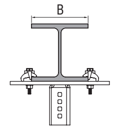
U-frames, Lorraine cross, cantilevers

Various connecting components, according to requirements for connections to existing structures / materials, are available for the applications mentioned above. The components selected have a decisive influence on the recommended max. loads.



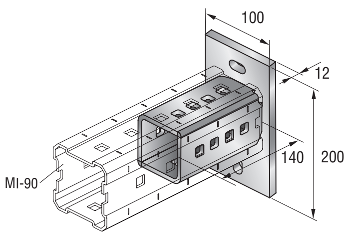


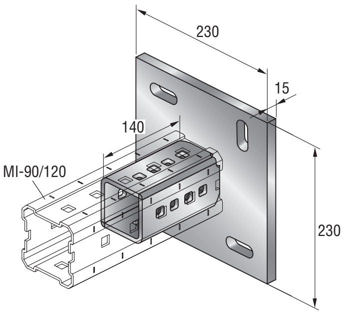
Connections to steel beams



Ordering designation	Steel beam flange width or height B	C [mm]	D [mm]	For MI girder
MIC-S90-AA	75–165	–	–	MI-90
MIC-S90-A	75–165	200	280	MI-90
MIC-S90-B	165–235	300	350	MI-90
MIC-S90-C	235–300	350	430	MI-90
MIC-S120-A	75–165	200	280	MI-120
MIC-S120-B	165–235	300	350	MI-120
MIC-S120-C	235–300	350	430	MI-120

Fastened using **MI-GC-M12** beam clamps (see individual parts).





Connections to concrete

Ordering designation	For MI girder
MIC-C90-AA	MI-90
MIC-C90-D	MI-90
MIC-C120-D	MI-120

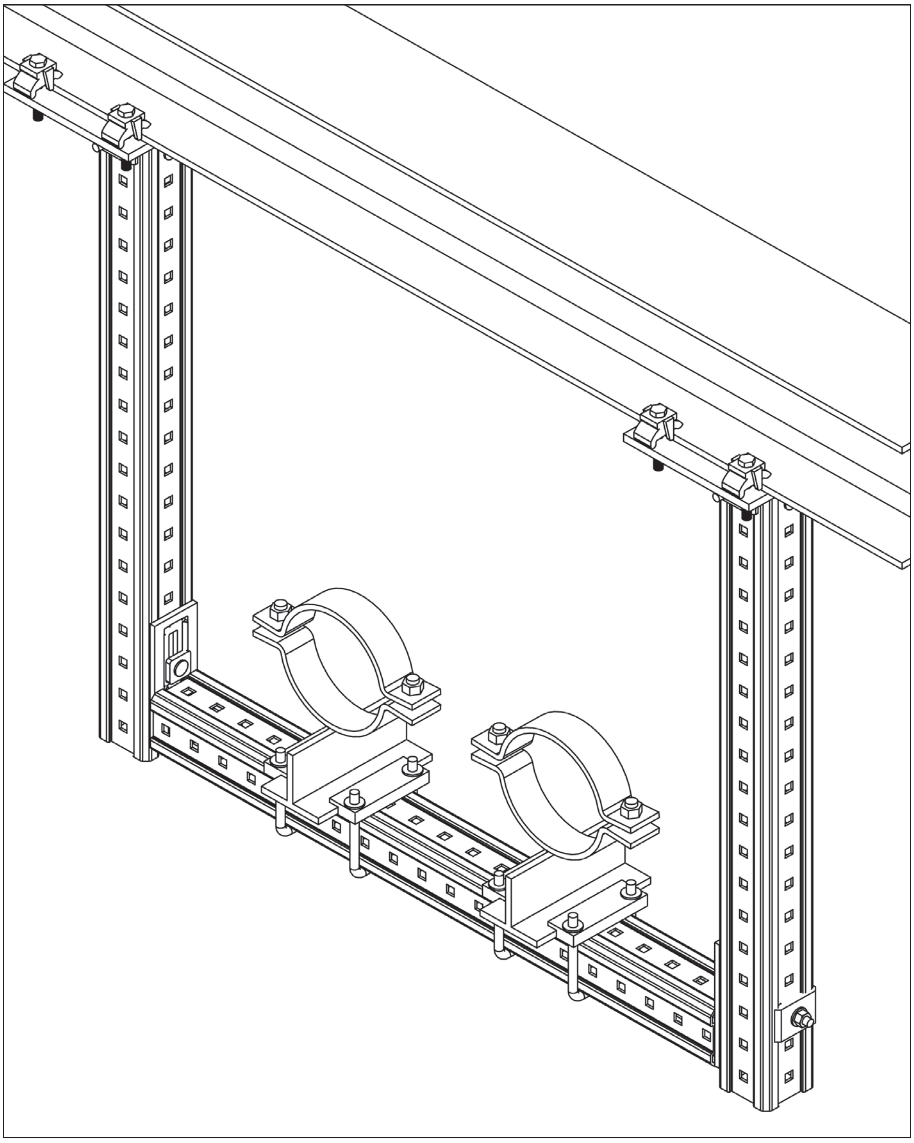
Fastened using approved Hilti anchors: **HST (R) M16 or HST (R) M12**; alternative approved Hilti anchors are the HDA, HVZ, HIT-TZ of the same nominal diameter and same version.

Safety factors for applications and individual parts

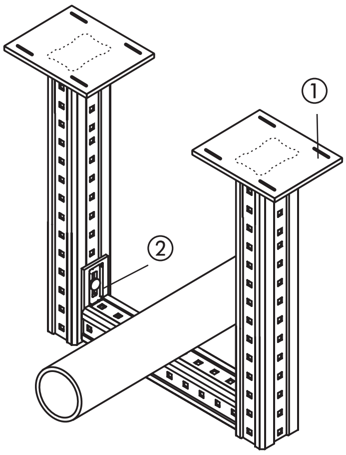
The values given in the subsequent tables take the following into account:
– All load values F are **recommended** loads
– Design values = recommended loads × 1.4 for **applications** or × 1.5 for **individual parts.**
– Concrete grade at least C20/25.
– Use of MIC-PG low-friction inserts; coefficient of friction μ = 0.15.
– Bolt tightening torque for M12 = 84 Nm; coefficient of friction μ = 0.12 for the bolt.
– Tightening torque for the MI-GC-M12 beam clamps = 69 Nm.

Note: The anchor load values apply to connections to concrete surfaces. Fastenings made at the edge of concrete components must be specially verified. The forces taken up by the base material (steel, concrete, etc..) must also be verified separately. The application guidelines contained in anchor approvals must be observed. Load values are in accordance with approvals, status May 2004.

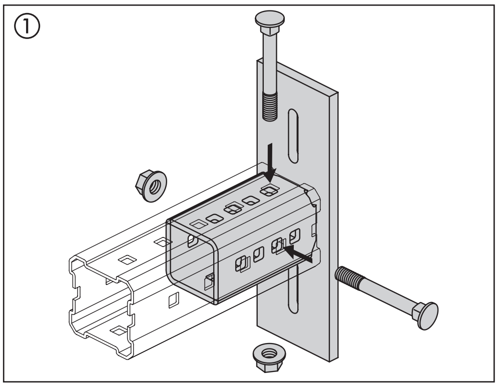
MI System applications - connections to steel

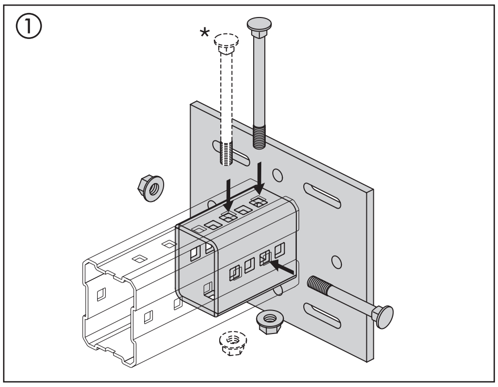


U-frames: General points

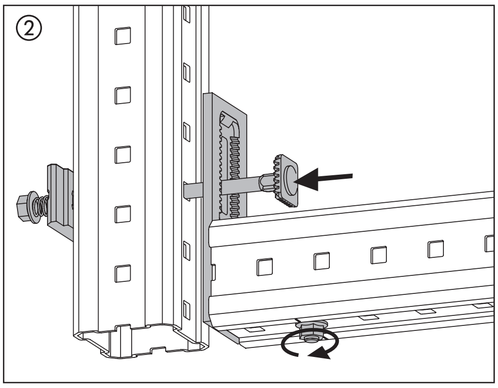


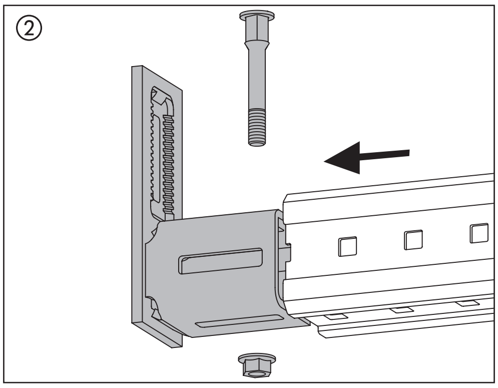
Connections to steel: MIC-S90-AA, MIC-S90/120-A/B/C





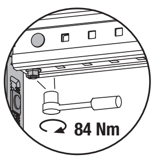
MI connector: MIC-90/120-U



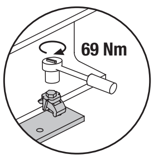


The MI connector must always make full contact with the MI girder. The bolts should be fitted as close as possible to the fastening plate. (Also see instructions on page 5.8.)
* In some cases, a higher load value can be achieved through use of a third bolt (see load tables). The bolt should be fitted in the direction of the horizontal force.
Note: The third bolt must be ordered additionally.

Bolt tightening torque:



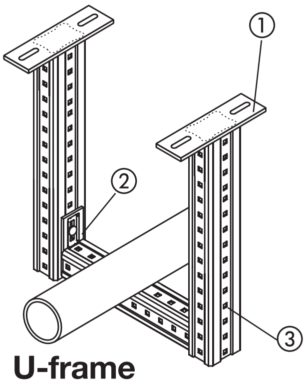
For connectors



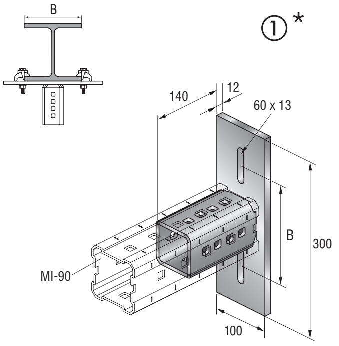
For beam clamps

MIC-S90-AA U-frames on steel beams

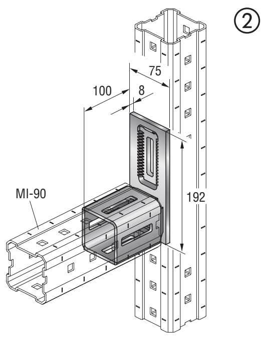
Crossbeam simply supported, columns restrained



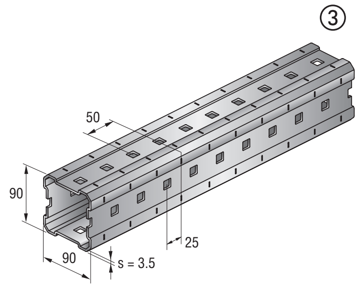
U-frame



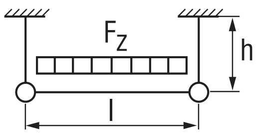
MIC-S90-AA



MIC-90-U



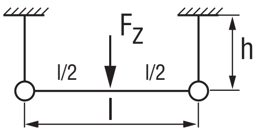
MI-90



Uniformly distributed load

Recommended working load Fz [kN] for girder length l [mm]

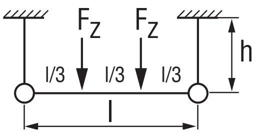
Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	18.81	18.79	18.77	17.72	15.31	12.04	9.69	7.94	6.61
500	Fz + Fx **	9.81	9.79	9.76	9.74	9.72	9.69	9.67	7.94	6.61
1000	Fz + Fx **	5.71	5.71	5.71	5.71	5.71	5.71	5.71	5.71	5.71
1500	Fz + Fx **	3.81	3.81	3.81	3.81	3.81	3.81	3.81	3.81	3.81
2000	Fz + Fx **	2.86	2.86	2.86	2.86	2.86	2.86	2.86	2.86	2.86
	*Fx = Fz × 0.15 ****									



1 single load

Recommended working load Fz [kN] for girder length l [mm]

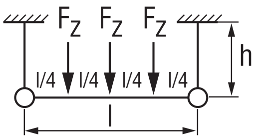
Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	15.53	12.42	10.34	8.85	7.72	6.84	6.05	4.96	4.13
500	Fz + Fx **	9.81	9.79	9.00	7.70	6.72	5.95	5.34	4.84	4.13
1000	Fz + Fx **	5.71	5.71	5.71	5.71	5.71	5.71	5.34	4.84	4.13
1500	Fz + Fx **	3.81	3.81	3.81	3.81	3.81	3.81	3.81	3.81	3.81
2000	Fz + Fx **	2.86	2.86	2.86	2.86	2.86	2.86	2.86	2.86	2.86
	*Fx = Fz × 0.15 ****									



2 single loads

Recommended working load Fz [kN] for girder length l [mm]

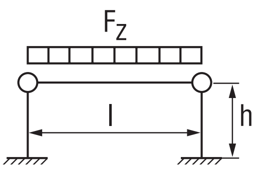
Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	9.41	9.29	7.74	6.62	5.62	4.42	3.55	2.91	2.42
500	Fz + Fx **	4.91	4.89	4.88	4.87	4.86	4.42	3.55	2.91	2.42
1000	Fz + Fx **	2.86	2.86	2.86	2.86	2.86	2.86	2.86	2.86	2.42
1500	Fz + Fx **	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90
2000	Fz + Fx **	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43
	*Fx = Fz × 0.15 ****									



3 single loads

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	6.27	6.22	5.19	4.45	3.90	3.22	2.60	2.15	1.81
500	Fz + Fx **	3.27	3.26	3.25	3.25	3.24	3.01	2.60	2.15	1.81
1000	Fz + Fx **	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.81
1500	Fz + Fx **	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
2000	Fz + Fx **	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
	*Fx = Fz × 0.15 ****									



All structures listed can also be used standing (see illustrations)

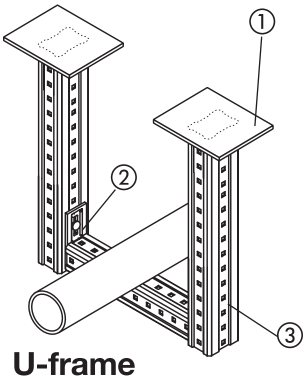
* Fastened to steel beam by way of MI-GC-M12 beam clamps (see individual parts)

** Value for F_Z with simultaneously acting horizontal load F_X.

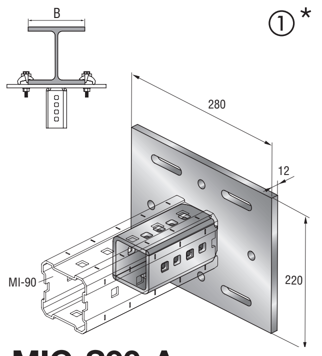
*** Applies to all values for $F_Z + F_X$, i.e. pipe friction is taken into account.

MIC-S90-A U-frames on steel beams

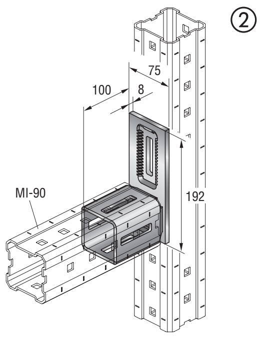
Crossbeam simply supported, columns restrained



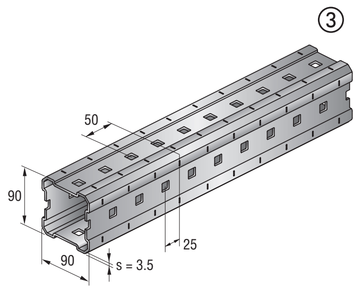
U-frame



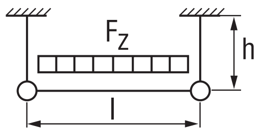
MIC-S90-A



MIC-90-U



MI-90

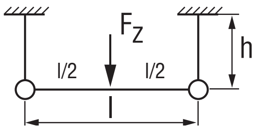


Uniformly distributed load

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	25.24	24.91	20.72	17.72	15.31	12.04	9.69	7.94	6.61
500	Fz + (Fx // Fy)**	9.81	9.79	9.76	9.74	9.72	9.69	9.67	7.94	6.61
1000	Fz + (Fx // Fy)**	9.43	9.43	9.43	9.43	9.43	9.43	9.43	7.94	6.61
1500	Fz + (Fx // Fy)**	6.29	6.29	6.29	6.29	6.29	6.29	6.29	6.29	6.29
2000	Fz + (Fx // Fy)**	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71

*Fx = Fy = Fz × 0.15 ****

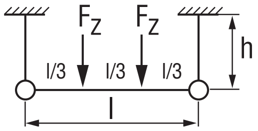


1 single load

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	15.53	12.42	10.34	8.85	7.72	6.84	6.05	4.96	4.13
500	Fz + (Fx // Fy)**	9.81	9.79	9.00	7.70	6.72	5.95	5.34	4.84	4.13
1000	Fz + (Fx // Fy)**	9.43	9.43	9.00	7.70	6.72	5.95	5.34	4.84	4.13
1500	Fz + (Fx // Fy)**	6.29	6.29	6.29	6.29	6.29	5.95	5.34	4.84	4.13
2000	Fz + (Fx // Fy)**	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.13

*Fx = Fy = Fz × 0.15 ****

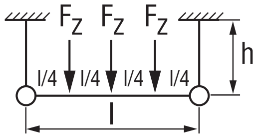


2 single loads

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	11.59	9.29	7.74	6.62	5.62	4.42	3.55	2.91	2.42
500	Fz + (Fx // Fy)**	4.91	4.89	4.88	4.87	4.86	4.42	3.55	2.91	2.42
1000	Fz + (Fx // Fy)**	4.71	4.71	4.71	4.71	4.71	4.42	3.55	2.91	2.42
1500	Fz + (Fx // Fy)**	3.14	3.14	3.14	3.14	3.14	3.14	3.55	2.91	2.42
2000	Fz + (Fx // Fy)**	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36

*Fx = Fy = Fz × 0.15 ****

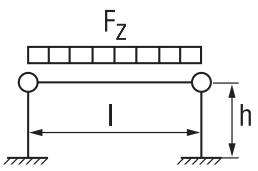


3 single loads

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	7.75	6.22	5.19	4.45	3.90	3.22	2.60	2.15	1.81
500	Fz + (Fx // Fy)**	3.27	3.26	3.25	3.25	3.24	3.01	2.60	2.15	1.81
1000	Fz + (Fx // Fy)**	3.14	3.14	3.14	3.14	3.14	3.01	2.60	2.15	1.81
1500	Fz + (Fx // Fy)**	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	1.81
2000	Fz + (Fx // Fy)**	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57

*Fx = Fy = Fz × 0.15 ****



All structures listed can also be used standing (see illustrations)

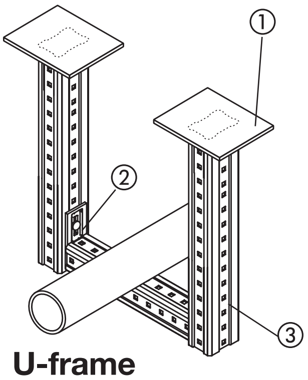
* Fastened to steel beam by way of MI-GC-M12 beam clamps (see individual parts)

** Value for F_Z with simultaneously acting horizontal load F_X or F_Y

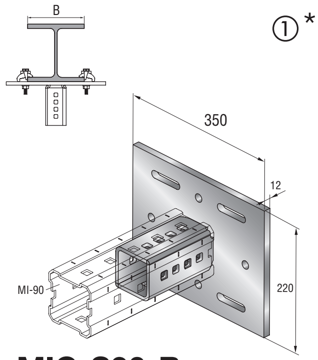
*** Applies to all values for Fz + Fx // Fy, i.e. pipe friction is taken into account (// = or)

MIC-S90-B U-frames on steel beams

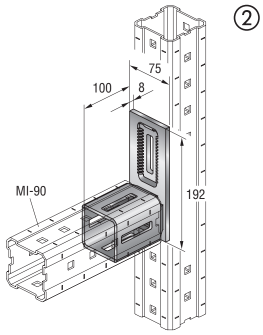
Crossbeam simply supported, columns restrained



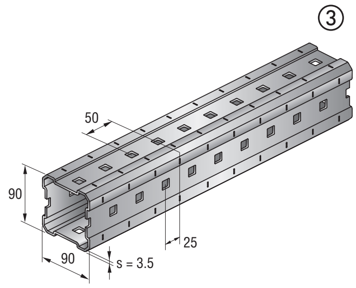
U-frame



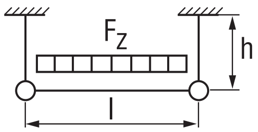
MIC-S90-B



MIC-90-U



MI-90

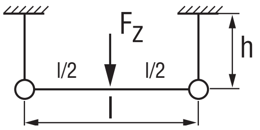


Uniformly distributed load

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	21.39	21.36	20.72	17.72	15.31	12.04	9.69	7.94	6.61
500	Fz + (Fx // Fy)**	9.81	9.79	9.76	9.74	9.72	9.69	9.67	7.94	6.61
1000	Fz + (Fx // Fy)**	9.00	9.00	9.00	9.00	9.00	9.00	9.00	7.94	6.61
1500	Fz + (Fx // Fy)**	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
2000	Fz + (Fx // Fy)**	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50

*Fx = Fy = Fz × 0.15 ****

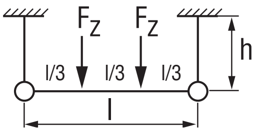


1 single load

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	15.53	12.42	10.34	8.85	7.72	6.84	6.05	4.96	4.13
500	Fz + (Fx // Fy)**	9.81	9.79	9.00	7.70	6.72	5.95	5.34	4.84	4.13
1000	Fz + (Fx // Fy)**	9.00	9.00	9.00	7.70	6.72	5.95	5.34	4.84	4.13
1500	Fz + (Fx // Fy)**	6.00	6.00	6.00	6.00	6.00	5.95	5.34	4.84	4.13
2000	Fz + (Fx // Fy)**	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.13

*Fx = Fy = Fz × 0.15 ****

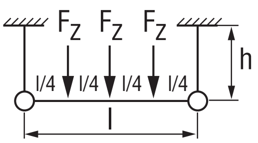


2 single loads

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	10.69	9.29	7.74	6.62	5.62	4.42	3.55	2.91	2.42
500	Fz + (Fx // Fy)**	4.91	4.89	4.88	4.87	4.86	4.42	3.55	2.91	2.42
1000	Fz + (Fx // Fy)**	4.50	4.50	4.50	4.50	4.50	4.42	3.55	2.91	2.42
1500	Fz + (Fx // Fy)**	3.00	3.00	3.00	3.00	3.00	3.00	3.00	2.91	2.42
2000	Fz + (Fx // Fy)**	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25

*Fx = Fy = Fz × 0.15 ****

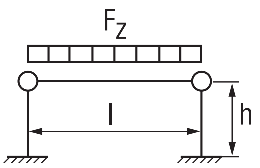


3 single loads

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	7.13	6.22	5.19	4.45	3.90	3.22	2.60	2.15	1.81
500	Fz + (Fx // Fy)**	3.27	3.26	3.25	3.25	3.24	3.01	2.60	2.15	1.81
1000	Fz + (Fx // Fy)**	3.00	3.00	3.00	3.00	3.00	3.00	2.60	2.15	1.81
1500	Fz + (Fx // Fy)**	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.81
2000	Fz + (Fx // Fy)**	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50

*Fx = Fy = Fz × 0.15 ****



All structures listed can also be used standing (see illustrations)

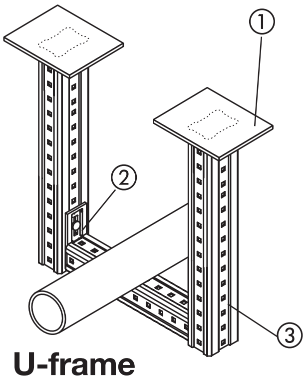
* Fastened to steel beam by way of MI-GC-M12 beam clamps (see individual parts)

** Value for F_Z with simultaneously acting horizontal load F_X or F_Y

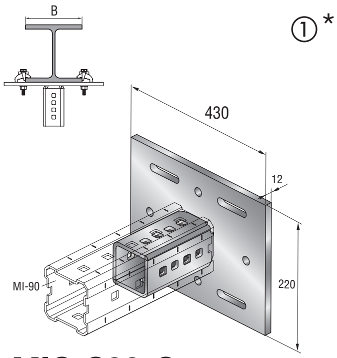
*** Applies to all values for Fz + Fx // Fy, i.e. pipe friction is taken into account (// = or)

MIC-S90-C U-frames on steel beams

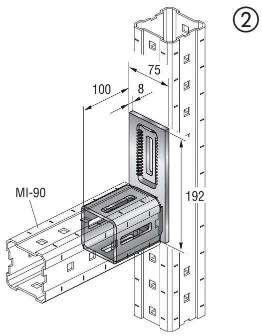
Crossbeam simply supported, columns restrained



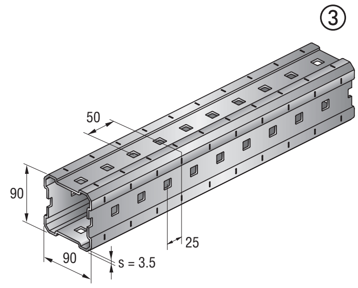
U-frame



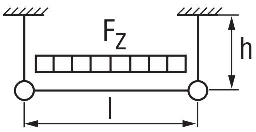
MIC-S90-C



MIC-90-U



MI-90

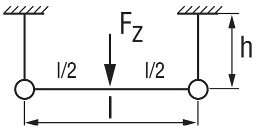


Uniformly distributed load

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	14.96	14.93	14.91	14.89	14.86	12.04	9.69	7.94	6.61
500	Fz + (Fx // Fy)**	6.77	6.75	6.72	6.70	6.68	6.65	6.63	6.61	6.58
1000	Fz + (Fx // Fy)**	6.29	6.29	6.29	6.29	6.29	6.29	6.29	6.29	6.29
1500	Fz + (Fx // Fy)**	4.19	4.19	4.19	4.19	4.19	4.19	4.19	4.19	4.19
2000	Fz + (Fx // Fy)**	3.14	3.14	3.14	3.14	3.14	3.14	3.14	3.14	3.14

*Fx = Fy = Fz × 0.15 ****

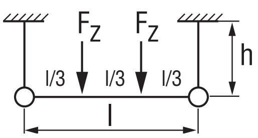


1 single load

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	14.96	12.42	10.34	8.85	7.72	6.84	6.05	4.96	4.13
500	Fz + (Fx // Fy)**	6.77	6.75	6.72	6.70	6.68	5.95	5.34	4.84	4.13
1000	Fz + (Fx // Fy)**	6.29	6.29	6.29	6.29	6.29	5.95	5.34	4.84	4.13
1500	Fz + (Fx // Fy)**	4.19	4.19	4.19	4.19	4.19	4.19	4.19	4.19	4.19
2000	Fz + (Fx // Fy)**	3.14	3.14	3.14	3.14	3.14	3.14	3.14	3.14	3.14

*Fx = Fy = Fz × 0.15 ****

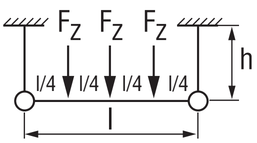


2 single loads

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	7.48	7.47	7.45	6.62	5.62	4.42	3.55	2.91	2.42
500	Fz + (Fx // Fy)**	3.39	3.37	3.36	3.35	3.34	3.33	3.31	2.91	2.42
1000	Fz + (Fx // Fy)**	3.14	3.14	3.14	3.14	3.14	3.14	3.14	2.91	2.42
1500	Fz + (Fx // Fy)**	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10
2000	Fz + (Fx // Fy)**	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57

*Fx = Fy = Fz × 0.15 ****

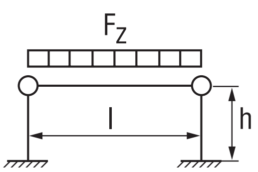


3 single loads

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	4.99	4.98	4.97	4.45	3.90	3.22	2.60	2.15	1.81
500	Fz + (Fx // Fy)**	2.26	2.25	2.24	2.23	2.23	2.22	2.21	2.15	1.81
1000	Fz + (Fx // Fy)**	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	1.81
1500	Fz + (Fx // Fy)**	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
2000	Fz + (Fx // Fy)**	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05

*Fx = Fy = Fz × 0.15 ****



All structures listed can also be used standing (see illustrations)

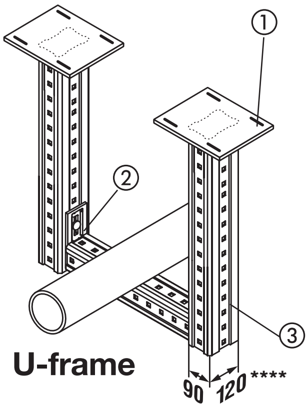
* Fastened to steel beam by way of MI-GC-M12 beam clamps (see individual parts)

** Value for F_Z with simultaneously acting horizontal load F_X or F_Y

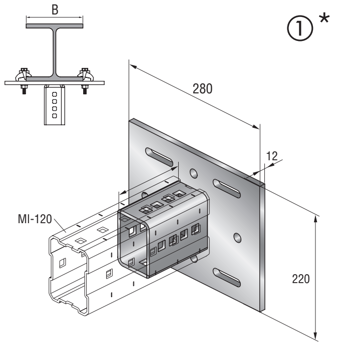
*** Applies to all values for Fz + Fx // Fy, i.e. pipe friction is taken into account (// = or)

MIC-S120-A U-frames on steel beams

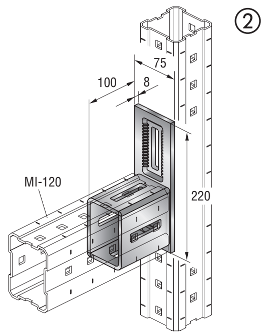
Crossbeam simply supported, columns restrained



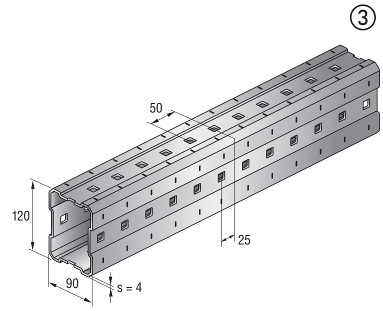
U-frame



MIC-S120-A

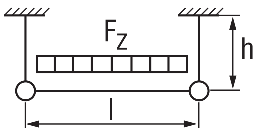


MIC-120-U



MI-120

**** All tablevalues only for showed applications.

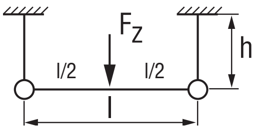


Uniformly distributed load

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	30.65	30.62	30.59	30.56	26.79	23.75	21.31	18.56	15.50
500	Fz + (Fx // Fy)**	11.75	11.72	11.68	11.65	11.62	11.59	11.56	11.53	11.49
1000	Fz + (Fx // Fy)**	9.57	9.57	9.57	9.57	9.57	9.57	9.57	9.57	9.57
1500	Fz + (Fx // Fy)**	6.38	6.38	6.38	6.38	6.38	6.38	6.38	6.38	6.38
2000	Fz + (Fx // Fy)**	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79

*Fx = Fy = Fz × 0.15 ****

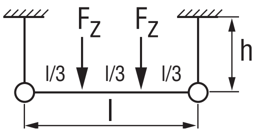


1 single load

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	26.86	21.49	17.90	15.32	13.38	11.86	10.65	9.65	8.82
500	Fz + (Fx // Fy)**	11.75	11.72	11.68	11.65	11.42	10.13	9.09	8.24	7.53
1000	Fz + (Fx // Fy)**	9.57	9.57	9.57	9.57	9.57	9.57	9.09	8.24	7.53
1500	Fz + (Fx // Fy)**	6.38	6.38	6.38	6.38	6.38	6.38	6.38	6.38	6.38
2000	Fz + (Fx // Fy)**	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79

*Fx = Fy = Fz × 0.15 ****

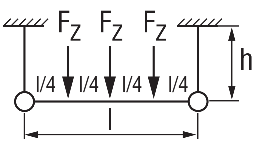


2 single loads

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	15.33	15.31	13.39	11.47	10.02	8.89	7.98	6.81	5.69
500	Fz + (Fx // Fy)**	5.87	5.86	5.84	5.83	5.81	5.79	5.78	5.76	5.65
1000	Fz + (Fx // Fy)**	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79
1500	Fz + (Fx // Fy)**	3.19	3.19	3.19	3.19	3.19	3.19	3.19	3.19	3.19
2000	Fz + (Fx // Fy)**	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39

*Fx = Fy = Fz × 0.15 ****

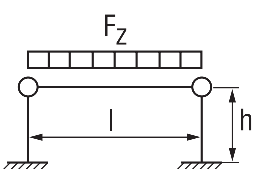


3 single loads

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	10.22	10.21	8.97	7.70	6.74	5.99	5.39	4.90	4.17
500	Fz + (Fx // Fy)**	3.92	3.91	3.89	3.88	3.87	3.86	3.85	3.84	3.83
1000	Fz + (Fx // Fy)**	3.19	3.19	3.19	3.19	3.19	3.19	3.19	3.19	3.19
1500	Fz + (Fx // Fy)**	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13
2000	Fz + (Fx // Fy)**	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60

*Fx = Fy = Fz × 0.15 ****



All structures listed can also be used standing (see illustrations)

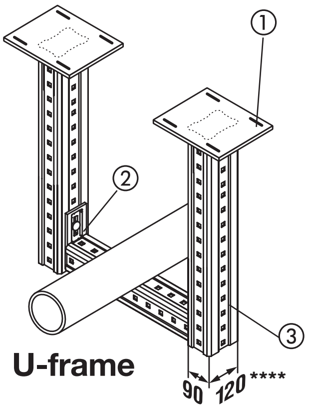
* Fastened to steel beam by way of MI-GC-M12 beam clamps (see individual parts)

** Value for F_Z with simultaneously acting horizontal load F_X or F_Y

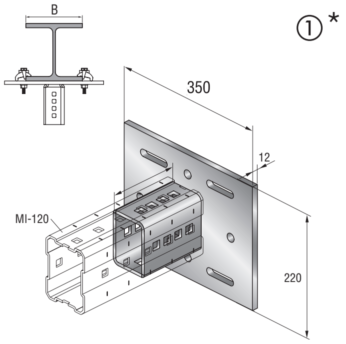
*** Applies to all values for Fz + Fx // Fy, i.e. pipe friction is taken into account (// = or)

MIC-S120-B U-frames on steel beams

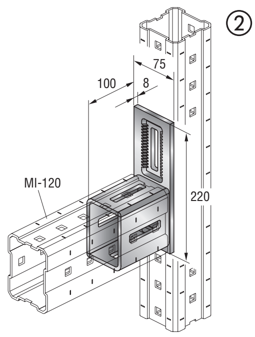
Crossbeam simply supported, columns restrained



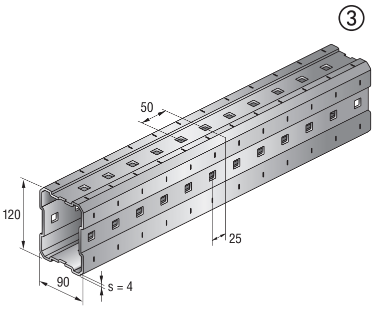
U-frame



MIC-S120-B

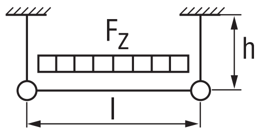


MIC-120-U



MI-120

**** All tablevalues only for showed applications.

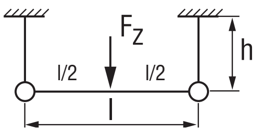


Uniformly distributed load

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	21.23	21.19	21.16	21.13	21.10	21.07	21.04	18.56	15.50
500	Fz + (Fx // Fy)**	12.15	12.12	12.08	12.05	12.02	11.99	11.96	11.93	11.89
1000	Fz + (Fx // Fy)**	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00
1500	Fz + (Fx // Fy)**	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
2000	Fz + (Fx // Fy)**	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50

*Fx = Fy = Fz × 0.15 ****

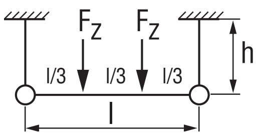


1 single load

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	21.23	21.19	17.90	15.32	13.38	11.86	10.65	9.65	8.82
500	Fz + (Fx // Fy)**	12.15	12.12	12.08	12.05	11.42	10.13	9.09	8.24	7.53
1000	Fz + (Fx // Fy)**	9.00	9.00	9.00	9.00	9.00	9.00	9.00	8.24	7.53
1500	Fz + (Fx // Fy)**	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
2000	Fz + (Fx // Fy)**	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50

*Fx = Fy = Fz × 0.15 ****

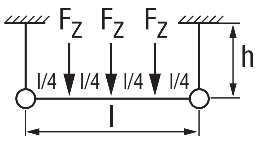


2 single loads

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	10.61	10.60	10.58	10.57	10.02	8.89	7.98	6.81	5.69
500	Fz + (Fx // Fy)**	6.07	6.06	6.04	6.03	6.01	5.99	5.98	5.96	5.65
1000	Fz + (Fx // Fy)**	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50
1500	Fz + (Fx // Fy)**	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
2000	Fz + (Fx // Fy)**	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25

*Fx = Fy = Fz × 0.15 ****

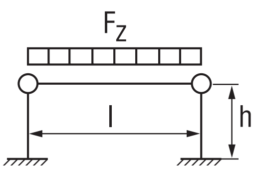


3 single loads

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	7.08	7.06	7.05	7.04	6.74	5.99	5.39	4.90	4.17
500	Fz + (Fx // Fy)**	4.05	4.04	4.03	4.02	4.01	4.00	3.99	3.98	3.83
1000	Fz + (Fx // Fy)**	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
1500	Fz + (Fx // Fy)**	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
2000	Fz + (Fx // Fy)**	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50

*Fx = Fy = Fz × 0.15 ****



All structures listed can also be used standing (see illustrations)

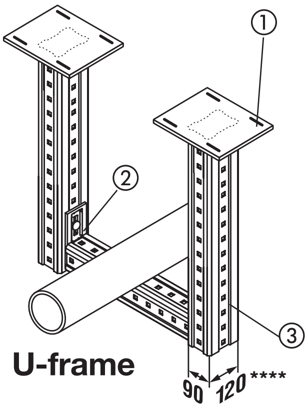
* Fastened to steel beam by way of MI-GC-M12 beam clamps (see individual parts)

** Value for F_Z with simultaneously acting horizontal load F_X or F_Y

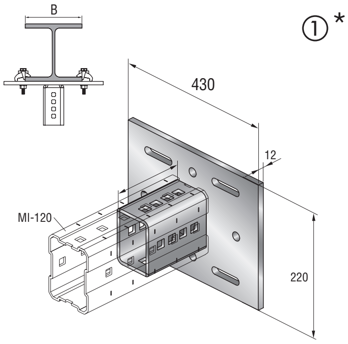
*** Applies to all values for Fz + Fx // Fy, i.e. pipe friction is taken into account (// = or)

MIC-S120-C U-frames on steel beams

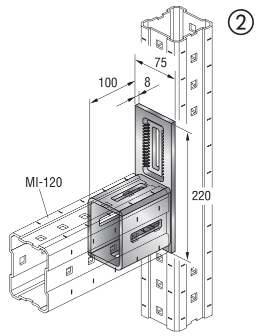
Crossbeam simply supported, columns restrained



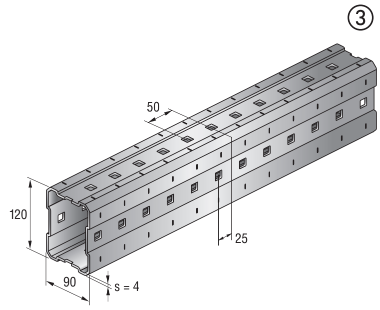
U-frame



MIC-S120-C

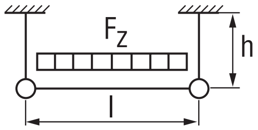


MIC-120-U



MI-120

**** All tablevalues only for showed applications.

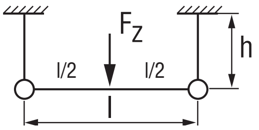


Uniformly distributed load

Recommended working load Fz [kN] for girder length l [cm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	16.73	16.69	16.66	16.63	16.60	16.57	16.54	16.50	15.50
500	Fz + (Fx // Fy)**	8.45	8.42	8.38	8.35	8.32	8.29	8.26	8.23	8.19
1000	Fz + (Fx // Fy)**	7.14	7.14	7.14	7.14	7.14	7.14	7.14	7.14	7.14
1500	Fz + (Fx // Fy)**	4.76	4.76	4.76	4.76	4.76	4.76	4.76	4.76	4.76
2000	Fz + (Fx // Fy)**	3.57	3.57	3.57	3.57	3.57	3.57	3.57	3.57	3.57

*Fx = Fy = Fz × 0.15 ****

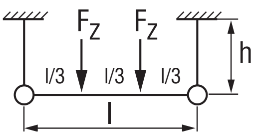


1 single load

Recommended working load Fz [kN] for girder length l [cm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	16.73	16.69	16.66	15.32	13.38	11.86	10.65	9.65	8.82
500	Fz + (Fx // Fy)**	8.45	8.42	8.38	8.35	8.32	8.29	8.26	8.23	7.53
1000	Fz + (Fx // Fy)**	7.14	7.14	7.14	7.14	7.14	7.14	7.14	7.14	7.14
1500	Fz + (Fx // Fy)**	4.76	4.76	4.76	4.76	4.76	4.76	4.76	4.76	4.76
2000	Fz + (Fx // Fy)**	3.57	3.57	3.57	3.57	3.57	3.57	3.57	3.57	3.57

*Fx = Fy = Fz × 0.15 ****

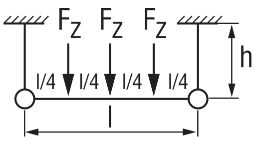


2 single loads

Recommended working load Fz [kN] for girder length l [cm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	8.36	8.35	8.33	8.32	8.30	8.28	7.98	6.81	5.69
500	Fz + (Fx // Fy)**	4.22	4.21	4.19	4.18	4.16	4.14	4.13	4.11	4.10
1000	Fz + (Fx // Fy)**	3.57	3.57	3.57	3.57	3.57	3.57	3.57	3.57	3.57
1500	Fz + (Fx // Fy)**	2.38	2.38	2.38	2.38	2.38	2.38	2.38	2.38	2.38
2000	Fz + (Fx // Fy)**	1.79	1.79	1.79	1.79	1.79	1.79	1.79	1.79	1.79

*Fx = Fy = Fz × 0.15 ****

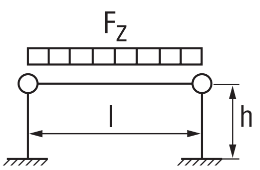


3 single loads

Recommended working load Fz [kN] for girder length l [cm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	5.58	5.56	5.55	5.54	5.53	5.52	5.39	4.90	4.17
500	Fz + (Fx // Fy)**	2.82	2.81	2.79	2.78	2.77	2.76	2.75	2.74	2.73
1000	Fz + (Fx // Fy)**	2.38	2.38	2.38	2.38	2.38	2.38	2.38	2.38	2.38
1500	Fz + (Fx // Fy)**	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59
2000	Fz + (Fx // Fy)**	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19

*Fx = Fy = Fz × 0.15 ****



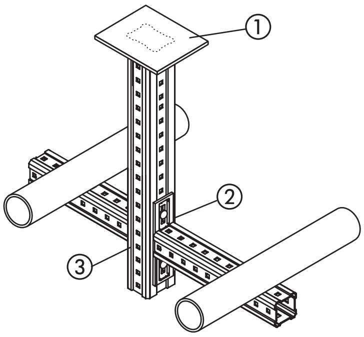
All structures listed can also be used standing (see illustrations)

* Fastened to steel beam by way of MI-GC-M12 beam clamps (see individual parts)

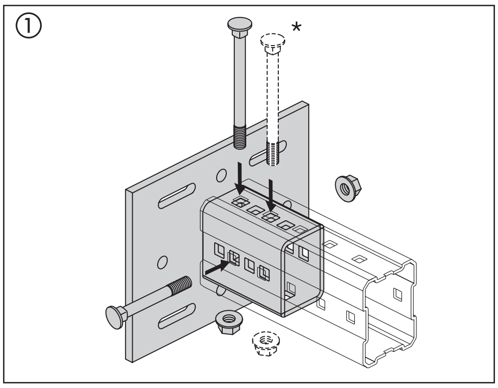
** Value for F_Z with simultaneously acting horizontal load F_X or F_Y

*** Applies to all values for Fz + Fx // Fy, i.e. pipe friction is taken into account (// = or)

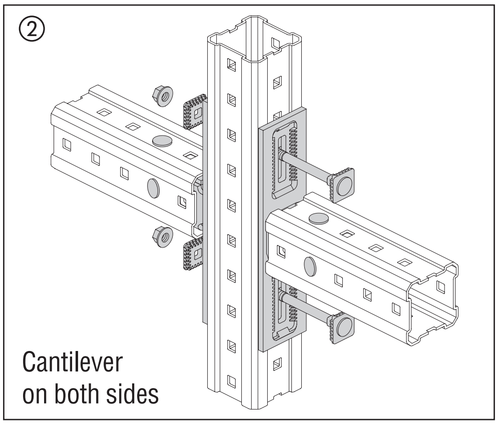
Lorraine cross: General points

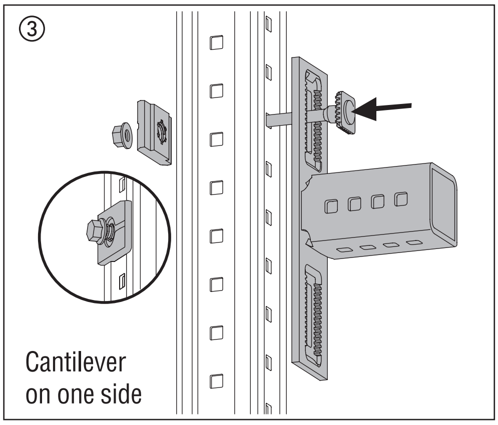


Connections to steel: MIC-S90/120-A/B/C



MI connector: MIC-90-L/MIA-TP/MIC-90-L

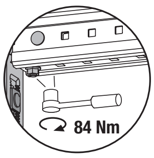


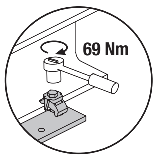


The MI connectors must always make full contact with the MI girder. The bolts should be fitted as close as possible to the fastening plate. (Also see instructions on page 5.8.)

* In some cases, a higher load value can be achieved through use of a third bolt (see load tables). The bolt should be fitted in the direction of the horizontal force.

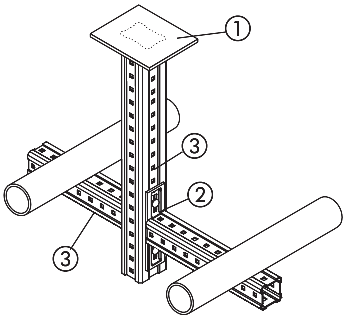
Note! The third bolt must be ordered additionally.



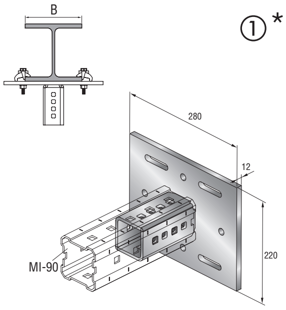


Bolt tightening torque: For connectors For beam clamps

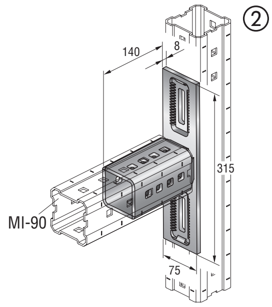
MIC-S90-A Lorraine cross on steel beam



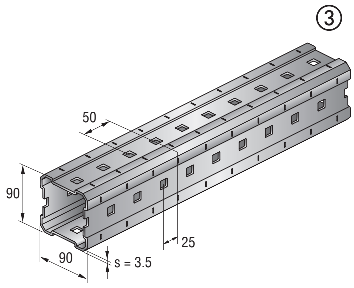
Lorraine cross



MIC-S90-A

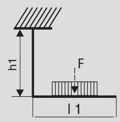
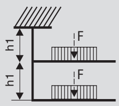
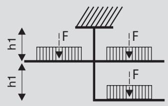
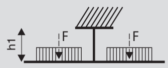
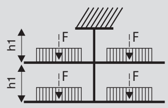


MIC-90-L



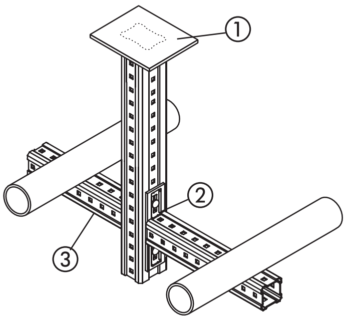
MI-90

Vertical MI-90 girder (recommended working load F_Z [kN])

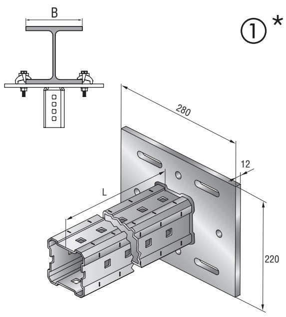
Configuration	Cantilever dimensions [mm] l1 \ h1	Loading condition 1 uniform loading ($F_Z = q \cdot l$) Fz [kN] 500	750	Loading condition 2 single load (½ F_Z ½) Fz [kN] 500	750	Loading condition 3 Fz [kN] 500	750	Loading condition 4 (⅓ ⅓ ⅓) Fz [kN] 500	750	Loading condition 5 (¼ ¼ ¼ ¼) Fz [kN] 500	750
	300	3.590	3.590	3.590	3.590	2.030	2.030	1.790	1.790	1.190	1.190
	500	2.340	2.340	2.340	2.340	1.270	1.270	1.170	1.170	0.780	0.780
	Fx = Fz × 0.15**										
	300	3.650	3.650	3.650	3.650	1.950	1.950	1.820	1.820	1.210	1.210
	500	2.300	2.300	2.300	2.300	1.150	1.150	1.150	1.150	0.760	0.760
	300	1.790	1.790	1.790	1.790	1.010	1.010	0.890	0.890	0.590	0.590
	500	1.170	1.170	1.170	1.170	0.630	0.630	0.580	0.580	0.390	0.390
	Fx = Fz × 0.15**										
	300	1.820	1.420	1.820	1.420	1.030	1.030	0.910	0.710	0.600	0.470
	500	1.190	1.190	1.190	1.190	0.640	0.640	0.590	0.590	0.390	0.390
	300	1.700	1.680	1.700	1.680	1.700	1.680	0.850	0.840	0.560	0.560
	500	1.680	1.660	1.680	1.660	1.270	1.270	0.840	0.830	0.560	0.550
	Fx = Fz × 0.15**										
	300	1.600	1.070	1.600	1.070	1.600	1.070	0.800	0.530	0.530	0.350
	500	1.600	1.070	1.600	1.070	1.150	1.070	0.800	0.530	0.530	0.350
	300	4.750	4.750	4.750	4.750	2.370	2.370	2.370	2.370	1.580	1.580
	500	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	0.940	0.940
	Fx = Fz × 0.15**										
	300	2.600	2.000	2.600	2.000	1.950	1.950	1.300	1.000	0.860	0.660
	500	2.300	2.000	2.300	2.000	1.150	1.150	1.150	1.000	0.760	0.660
	300	3.870	3.850	3.870	3.850	2.370	2.370	1.930	1.920	1.290	1.280
	500	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	0.940	0.940
	Fx = Fz × 0.15**										
	300	1.000	0.660	1.000	0.660	1.000	0.660	0.500	0.330	0.330	0.220
	500	1.000	0.660	1.000	0.660	1.000	0.660	0.500	0.330	0.330	0.220

* Fastened to steel beam by way of MI-GC-M12 beam clamps (see individual parts).
** Value for F_Z with simultaneously acting horizontal load F_X, i.e. pipe friction is taken into account.

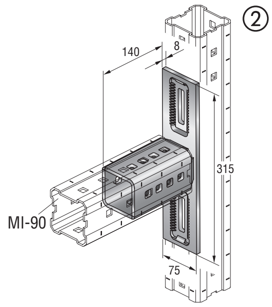
MIC-S90-A welded bracket – Lorraine cross on steel beam



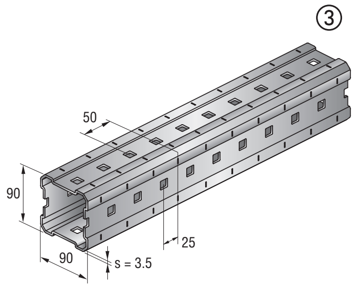
Lorraine cross



MIC-S90-A-[L]

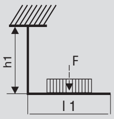
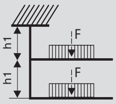
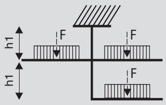
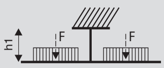
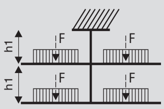


MIC-90-L



MI-90

Vertical MI-90 girder (recommended working load F_Z [kN])

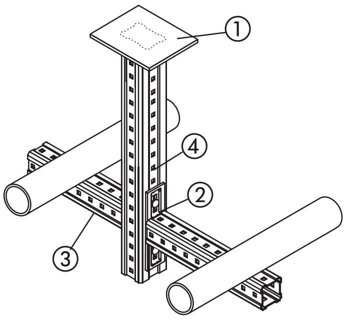
Configuration	Cantilever dimensions [mm]	Loading condition 1 uniform loading ($F_z = q \cdot l$) Fz [kN]			Loading condition 2 single load (Fz, 1/2, 1/2) Fz [kN]			Loading condition 3 (Fz) Fz [kN]			Loading condition 4 (Fz Fz, 1/3 1/3 1/3) Fz [kN]			Loading condition 5 (Fz Fz Fz, 1/4 1/4 1/4 1/4) Fz [kN]		
	l1 \ h1	500	750	1000	500	750	1000	500	750	1000	500	750	1000	500	750	1000
	300	4.750	4.750	4.750	4.750	4.750	4.750	2.370	2.370	2.370	2.370	2.370	2.370	1.580	1.580	1.580
	500	2.820	2.820	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	1.410	1.410	0.940	0.940	0.940
	Fx = Fz × 0.15**															
	300	3.260	3.260	3.260	3.260	3.260	3.260	1.840	1.840	1.840	1.630	1.630	1.630	1.080	1.080	1.080
	500	2.130	2.130	2.130	2.130	2.130	2.130	1.150	1.150	1.150	1.060	1.060	1.060	0.710	0.710	0.710
	300	2.730	2.730	2.730	2.730	2.730	2.730	1.540	1.540	1.540	1.360	1.360	1.360	0.910	0.910	0.910
	500	1.790	1.790	1.790	1.790	1.790	1.790	0.970	0.970	0.970	0.890	0.890	0.890	0.590	0.590	0.590
	Fx = Fz × 0.15**															
	300	1.630	1.630	1.420	1.630	1.630	1.420	0.920	0.920	0.920	0.810	0.810	0.710	0.540	0.540	0.470
	500	1.060	1.060	1.060	1.060	1.060	1.060	0.570	0.570	0.570	0.530	0.530	0.530	0.350	0.350	0.350
	300	2.380	2.360	2.340	2.380	2.360	2.340	2.370	2.360	2.340	1.190	1.180	1.170	0.790	0.780	0.780
	500	2.360	2.340	2.320	2.360	2.340	2.320	1.410	1.410	1.410	1.180	1.170	1.160	0.780	0.780	0.770
	Fx = Fz × 0.15**															
	300	2.140	1.420	1.070	2.140	1.420	1.070	1.840	1.420	1.070	1.070	0.710	0.530	0.710	0.470	0.350
	500	2.130	1.420	1.070	2.130	1.420	1.070	1.150	1.150	1.070	1.060	0.710	0.530	0.710	0.470	0.350
	300	4.750	4.750	4.750	4.750	4.750	4.750	2.370	2.370	2.370	2.370	2.370	2.370	1.580	1.580	1.580
	500	2.820	2.820	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	1.410	1.410	0.940	0.940	0.940
	Fx = Fz × 0.15**															
	300	3.890	2.850	2.140	3.890	2.850	2.140	1.950	1.950	1.950	1.940	1.420	1.070	1.290	0.950	0.710
	500	2.300	2.300	2.140	2.300	2.300	2.140	1.150	1.150	1.150	1.150	1.150	1.070	0.760	0.760	0.710
	300	4.750	4.750	4.750	4.750	4.750	4.750	2.370	2.370	2.370	2.370	2.370	2.370	1.580	1.580	1.580
	500	2.820	2.820	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	1.410	1.410	0.940	0.940	0.940
	Fx = Fz × 0.15**															
	300	1.420	0.950	0.710	1.420	0.950	0.710	1.420	0.950	0.710	0.710	0.470	0.350	0.470	0.310	0.230
	500	1.420	0.950	0.710	1.420	0.950	0.710	1.150	0.950	0.710	0.710	0.470	0.350	0.470	0.310	0.230

* Fastened to steel beam by way of MI-GC-M12 beam clamps (see individual parts).

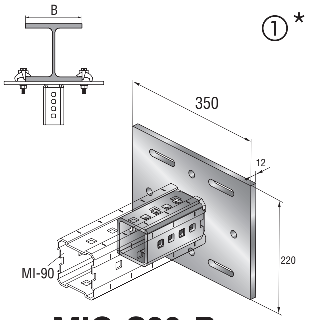
** Value for F_Z with simultaneously acting horizontal load F_X, i.e. pipe friction is taken into account.

[L] Length of bracket: 500 mm, 750 mm or 1000 mm

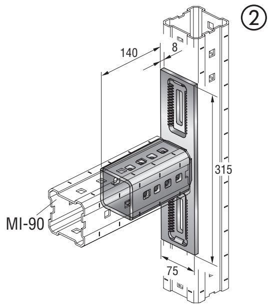
MIC-S90-B Lorraine cross on steel beam



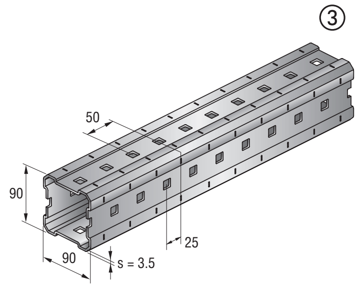
Lorraine cross



MIC-S90-B

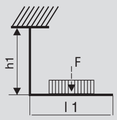
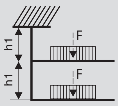
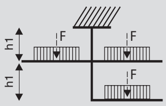
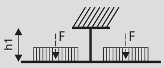
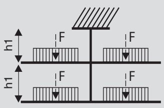


MIC-90-L



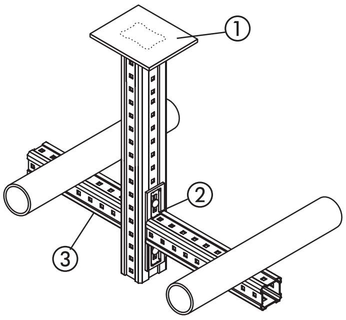
MI-90

Vertical MI-90 girder (recommended working load F_Z [kN])

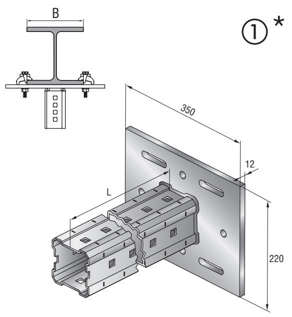
Configuration	Cantilever dimensions [mm]	Loading condition 1 uniform loading ($F_z = q \cdot l$) Fz [kN]		Loading condition 2 single load (½ Fz ½) Fz [kN]		Loading condition 3 Fz [kN]		Loading condition 4 (⅓ Fz ⅓ Fz ⅓) Fz [kN]		Loading condition 5 (¼ Fz ¼ Fz ¼ Fz ¼) Fz [N]	
	l1 \ h1	500	750	500	750	500	750	500	750	500	750
	300	3.430	3.430	3.430	3.430	1.940	1.940	1.710	1.710	1.140	1.140
	500	2.240	2.240	2.240	2.240	1.210	1.210	1.120	1.120	0.740	0.740
	Fx = Fz×0.15**										
	300	3.650	2.660	3.650	2.660	1.950	1.950	1.820	1.330	1.210	0.880
	500	2.300	2.300	2.300	2.300	1.150	1.150	1.150	1.150	0.760	0.760
	300	1.710	1.710	1.710	1.710	0.970	0.970	0.850	0.850	0.570	0.570
	500	1.120	1.120	1.120	1.120	0.600	0.600	0.560	0.560	0.370	0.370
	Fx = Fz×0.15**										
	300	1.330	0.880	1.330	0.880	1.030	0.880	0.660	0.440	0.440	0.290
	500	1.190	0.880	1.190	0.880	0.640	0.640	0.590	0.440	0.390	0.290
	300	1.700	1.680	1.700	1.680	1.700	1.680	0.850	0.840	0.560	0.560
	500	1.680	1.660	1.680	1.660	1.210	1.210	0.840	0.830	0.560	0.550
	Fx = Fz×0.15**										
	300	1.000	0.660	1.000	0.660	1.000	0.660	0.500	0.330	0.330	0.220
	500	1.000	0.660	1.000	0.660	1.000	0.660	0.500	0.330	0.330	0.220
	300	4.750	4.750	4.750	4.750	2.370	2.370	2.370	2.370	1.580	1.580
	500	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	0.940	0.940
	Fx = Fz×0.15**										
	300	2.250	1.660	2.250	1.660	1.950	1.660	1.120	0.830	0.750	0.550
	500	2.230	1.660	2.230	1.660	1.150	1.150	1.110	0.830	0.740	0.550
	300	2.660	2.650	2.660	2.650	2.370	2.370	1.330	1.320	0.880	0.880
	500	2.640	2.630	2.640	2.630	1.410	1.410	1.320	1.310	0.880	0.870
	Fx = Fz×0.15**										
	300	0.830	0.550	0.830	0.550	0.830	0.550	0.410	0.270	0.270	0.180
	500	0.830	0.550	0.830	0.550	0.830	0.550	0.410	0.270	0.270	0.180

* Fastened to steel beam by way of MI-GC-M12 beam clamps (see individual parts).
** Value for F_Z with simultaneously acting horizontal load F_X, i.e. pipe friction is taken into account.

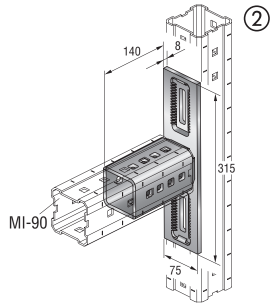
MIC-S90-B welded bracket – Lorraine cross on steel beam



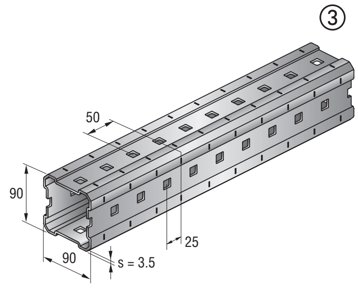
Lorraine cross



MIC-S90-B-[L]

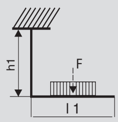
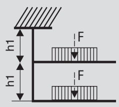
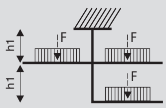
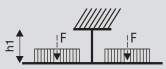
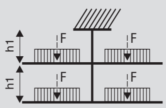


MIC-90-L



MI-90

Vertical MI-90 girder (recommended working load F_Z [kN])

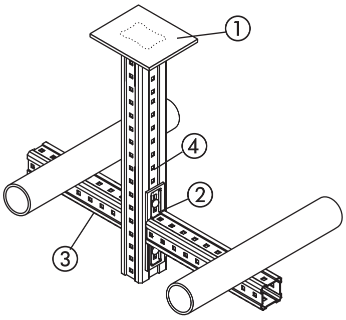
Configuration	Cantilever dimensions [mm]	Loading condition 1 uniform loading ($F_Z = q \cdot l$) Fz [kN]			Loading condition 2 single load (½ Fz ½) Fz [kN]			Loading condition 3 Fz [kN]			Loading condition 4 (⅓ Fz ⅓ Fz ⅓) Fz [kN]			Loading condition 5 (¼ Fz ¼ Fz ¼ Fz ¼) Fz [kN]		
	l1 \ h1	500	750	1000	500	750	1000	500	750	1000	500	750	1000	500	750	1000
	300	4.360	4.360	4.360	4.360	4.360	4.360	2.370	2.370	2.370	2.180	2.180	2.180	1.450	1.450	1.450
	500	2.820	2.820	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	1.410	1.410	0.940	0.940	0.940
	Fx = Fz × 0.15**															
	300	2.710	2.710	2.710	2.710	2.710	2.710	1.530	1.530	1.530	1.350	1.350	1.350	0.900	0.900	0.900
	500	1.760	1.760	1.760	1.760	1.760	1.760	0.950	0.950	0.950	0.880	0.880	0.880	0.580	0.580	0.580
	300	2.180	2.180	2.180	2.180	2.180	2.180	1.230	1.230	1.230	1.090	1.090	1.090	0.720	0.720	0.720
	500	1.420	1.420	1.420	1.420	1.420	1.420	0.770	0.770	0.770	0.710	0.710	0.710	0.470	0.470	0.470
	Fx = Fz × 0.15**															
	300	1.350	1.350	1.190	1.350	1.350	1.190	0.760	0.760	0.760	0.670	0.670	0.590	0.450	0.450	0.390
	500	0.880	0.880	0.880	0.880	0.880	0.880	0.470	0.470	0.470	0.440	0.440	0.440	0.290	0.290	0.290
	300	1.700	1.680	1.660	1.700	1.680	1.660	1.700	1.680	1.660	0.850	0.840	0.830	0.560	0.560	0.550
	500	1.680	1.660	1.640	1.680	1.660	1.640	1.410	1.410	1.410	0.840	0.830	0.820	0.560	0.550	0.540
	Fx = Fz × 0.15**															
	300	1.700	1.190	0.890	1.700	1.190	0.890	1.530	1.190	0.890	0.850	0.590	0.440	0.560	0.390	0.290
	500	1.680	1.190	0.890	1.680	1.190	0.890	0.950	0.950	0.890	0.840	0.590	0.440	0.560	0.390	0.290
	300	4.750	4.750	4.750	4.750	4.750	4.750	2.370	2.370	2.370	2.370	2.370	2.370	1.580	1.580	1.580
	500	2.820	2.820	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	1.410	1.410	0.940	0.940	0.940
	Fx = Fz × 0.15**															
	300	2.600	2.380	1.780	2.600	2.380	1.780	1.950	1.950	1.780	1.300	1.190	0.890	0.860	0.790	0.590
	500	2.300	2.300	1.780	2.300	2.300	1.780	1.150	1.150	1.150	1.150	1.150	0.890	0.760	0.760	0.590
	300	3.060	3.050	3.030	3.060	3.050	3.030	2.370	2.370	2.370	1.530	1.520	1.510	1.020	1.010	1.010
	500	2.820	2.820	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	1.410	1.410	0.940	0.940	0.940
	Fx = Fz × 0.15**															
	300	1.190	0.790	0.590	1.190	0.790	0.590	1.190	0.790	0.590	0.590	0.390	0.290	0.390	0.260	0.190
	500	1.190	0.790	0.590	1.190	0.790	0.590	1.150	0.790	0.590	0.590	0.390	0.290	0.390	0.260	0.190

* Fastened to steel beam by way of MI-GC-M12 beam clamps (see individual parts).

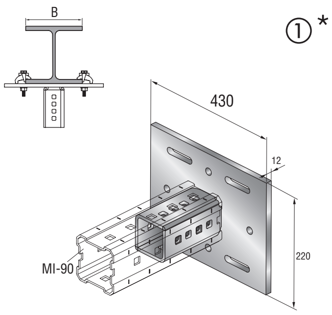
** Value for F_Z with simultaneously acting horizontal load F_X, i.e. pipe friction is taken into account.

[L] Length of bracket: 500 mm, 750 mm or 1000 mm

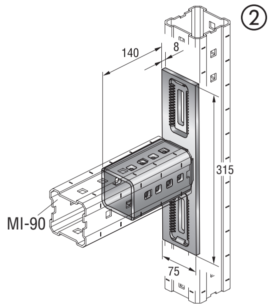
MIC-S90-C Lorraine cross on steel beam



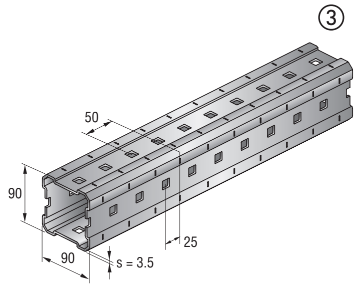
Lorraine cross



MIC-S90-C

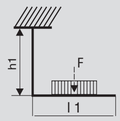
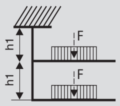
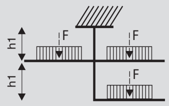
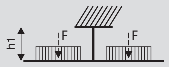
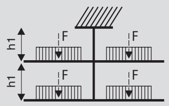


MIC-90-L



MI-90

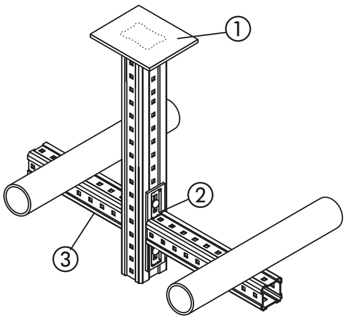
Vertical MI-90 girder (recommended working load F_Z [kN])

Configuration	Cantilever dimensions [mm]	Loading condition 1 uniform loading ($F_z = q \cdot l$) Fz [kN]		Loading condition 2 single load (½ Fz ½) Fz [kN]		Loading condition 3 Fz [kN]		Loading condition 4 (⅓ Fz ⅓ Fz ⅓) Fz [kN]		Loading condition 5 (¼ Fz ¼ Fz ¼ Fz ¼) Fz [kN]	
	l1 \ h1	500	750	500	750	500	750	500	750	500	750
	300	3.520	3.490	3.520	3.490	2.030	2.030	1.760	1.740	1.170	1.160
	500	2.340	2.340	2.340	2.340	1.270	1.270	1.170	1.170	0.780	0.780
	Fx = Fz × 0.15**										
	300	3.090	2.190	3.090	2.190	1.810	1.810	1.540	1.090	1.030	0.730
	500	2.090	2.090	2.090	2.090	1.130	1.130	1.040	1.040	0.690	0.690
	300	1.710	1.680	1.710	1.680	1.010	1.010	0.850	0.840	0.570	0.560
	500	1.170	1.170	1.170	1.170	0.630	0.630	0.580	0.580	0.390	0.390
	Fx = Fz × 0.15**										
	300	1.090	0.730	1.090	0.730	0.900	0.730	0.540	0.360	0.360	0.240
	500	1.040	0.730	1.040	0.730	0.560	0.560	0.520	0.360	0.340	0.240
	300	1.130	1.110	1.130	1.110	1.130	1.110	0.560	0.550	0.370	0.370
	500	1.110	1.090	1.110	1.090	1.110	1.090	0.550	0.540	0.370	0.360
	Fx = Fz × 0.15**										
	300	0.820	0.540	0.820	0.540	0.820	0.540	0.410	0.270	0.270	0.180
	500	0.820	0.540	0.820	0.540	0.820	0.540	0.410	0.270	0.270	0.180
	300	3.780	3.760	3.780	3.760	2.370	2.370	1.890	1.880	1.260	1.250
	500	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	0.940	0.940
	Fx = Fz × 0.15**										
	300	1.830	1.330	1.830	1.330	1.830	1.330	0.910	0.660	0.610	0.440
	500	1.810	1.330	1.810	1.330	1.150	1.150	0.900	0.660	0.600	0.440
	300	1.860	1.840	1.860	1.840	1.860	1.840	0.930	0.920	0.620	0.610
	500	1.840	1.820	1.840	1.820	1.410	1.410	0.920	0.910	0.610	0.600
	Fx = Fz × 0.15**										
	300	0.660	0.440	0.660	0.440	0.660	0.440	0.330	0.220	0.220	0.140
	500	0.660	0.440	0.660	0.440	0.660	0.440	0.330	0.220	0.220	0.140

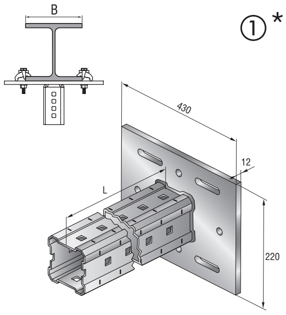
* Fastened to steel beam by way of MI-GC-M12 beam clamps (see individual parts).

** Value for F_Z with simultaneously acting horizontal load F_X, i.e. pipe friction is taken into account.

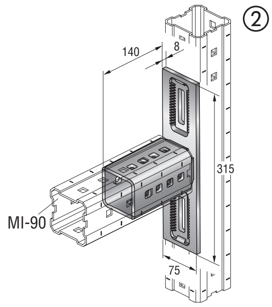
MIC-S90-C welded bracket – Lorraine cross on steel beam



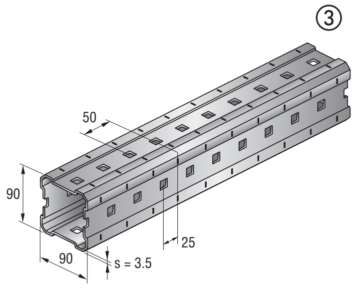
Lorraine cross



MIC-S90-C-[L]

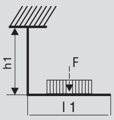
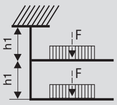
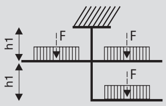
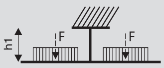
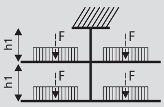


MIC-90-L



MI-90

Vertical MI-90 girder (recommended working load F_Z [kN])

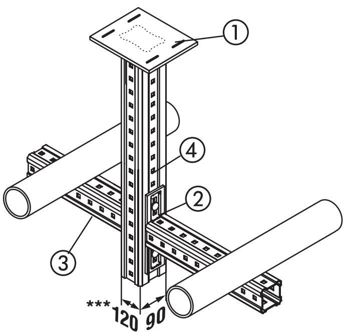
Configuration	Cantilever dimensions [mm]	Loading condition 1 uniform loading ($F_Z = q \cdot l$) Fz [kN]			Loading condition 2 single load (½ Fz ½) Fz [kN]			Loading condition 3 Fz [kN]			Loading condition 4 (⅓ Fz ⅓ Fz ⅓) Fz [kN]			Loading condition 5 (¼ Fz ¼ Fz ¼ Fz ¼) Fz [kN]		
	l1 \ h1	500	750	1000	500	750	1000	500	750	1000	500	750	1000	500	750	1000
	300	3.260	3.260	3.260	3.260	3.260	3.260	1.840	1.840	1.840	1.630	1.630	1.630	1.080	1.080	1.080
	500	2.130	2.130	2.130	2.130	2.130	2.130	1.150	1.150	1.150	1.060	1.060	1.060	0.710	0.710	0.710
	Fx = Fz × 0.15** 300	2.160	2.160	2.160	2.160	2.160	2.160	1.220	1.220	1.220	1.080	1.080	1.080	0.720	0.720	0.720
	500	1.400	1.400	1.400	1.400	1.400	1.400	0.760	0.760	0.760	0.700	0.700	0.700	0.460	0.460	0.460
	300	1.630	1.630	1.630	1.630	1.630	1.630	0.920	0.920	0.920	0.810	0.810	0.810	0.540	0.540	0.540
	500	1.060	1.060	1.060	1.060	1.060	1.060	0.570	0.570	0.570	0.530	0.530	0.530	0.350	0.350	0.350
	Fx = Fz × 0.15** 300	1.080	1.080	0.950	1.080	1.080	0.950	0.610	0.610	0.610	0.540	0.540	0.470	0.360	0.360	0.310
	500	0.700	0.700	0.700	0.700	0.700	0.700	0.380	0.380	0.380	0.350	0.350	0.350	0.230	0.230	0.230
	300	1.340	1.320	1.300	1.340	1.320	1.300	1.340	1.320	1.300	0.670	0.660	0.650	0.440	0.440	0.430
	500	1.330	1.300	1.280	1.330	1.300	1.280	1.150	1.150	1.150	0.660	0.650	0.640	0.440	0.430	0.420
	Fx = Fz × 0.15** 300	1.310	0.950	0.710	1.310	0.950	0.710	1.220	0.950	0.710	0.650	0.470	0.350	0.430	0.310	0.230
	500	1.290	0.950	0.710	1.290	0.950	0.710	0.760	0.760	0.710	0.640	0.470	0.350	0.430	0.310	0.230
	300	4.260	4.250	4.230	4.260	4.250	4.230	2.370	2.370	2.370	2.130	2.120	2.110	1.420	1.410	1.410
	500	2.820	2.820	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	1.410	1.410	0.940	0.940	0.940
	Fx = Fz × 0.15** 300	2.010	1.900	1.420	2.010	1.900	1.420	1.950	1.900	1.420	1.000	0.950	0.710	0.670	0.630	0.470
	500	1.990	1.900	1.420	1.990	1.900	1.420	1.150	1.150	1.150	0.990	0.950	0.710	0.660	0.630	0.470
	300	2.100	2.080	2.070	2.100	2.080	2.070	2.100	2.080	2.070	1.050	1.040	1.030	0.700	0.690	0.690
	500	2.080	2.060	2.050	2.080	2.060	2.050	1.410	1.410	1.410	1.040	1.030	1.020	0.690	0.680	0.680
	Fx = Fz × 0.15** 300	0.950	0.630	0.470	0.950	0.630	0.470	0.950	0.630	0.470	0.470	0.310	0.230	0.310	0.210	0.150
	500	0.950	0.630	0.470	0.950	0.630	0.470	0.950	0.630	0.470	0.470	0.310	0.230	0.310	0.210	0.150

* Fastened to steel beam by way of MI-GC-M12 beam clamps (see individual parts).

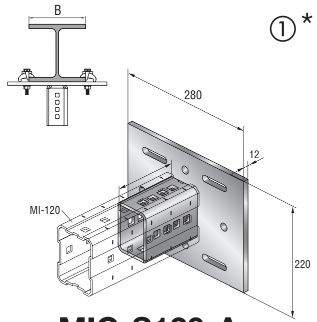
** Value for F_Z with simultaneously acting horizontal load F_X, i.e. pipe friction is taken into account.

[L] Length of bracket: 500 mm, 750 mm or 1000 mm

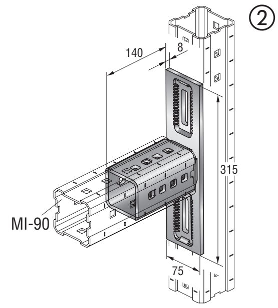
MIC-S120-A Lorraine cross on steel beam



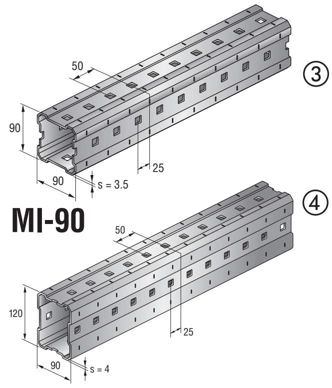
Lorraine cross



MIC-S120-A



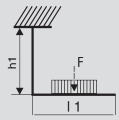
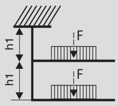
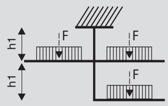
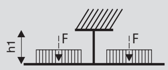
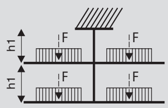
MIC-90-L



MI-120

*** All tablevalues only for showed applications.

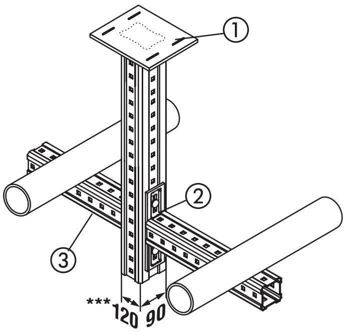
Vertical MI-120 girder (recommended working load F_Z [kN])

Configuration	Cantilever dimensions [mm] l1 \ h1	Loading condition 1 uniform loading ($F_z = q \cdot l$) Fz [kN] 500	750	Loading condition 2 single load Fz [kN] 500	750	Loading condition 3 Fz [kN] 500	750	Loading condition 4 Fz [kN] 500	750	Loading condition 5 Fz [kN] 500	750
	300	3.900	3.900	3.900	3.900	2.270	2.270	1.950	1.950	1.300	1.300
	500	2.610	2.610	2.610	2.610	1.410	1.410	1.300	1.300	0.870	0.870
	Fx = Fz×0.15**										
	300	3.900	3.900	3.900	3.900	1.950	1.950	1.950	1.950	1.300	1.300
	500	2.300	2.300	2.300	2.300	1.150	1.150	1.150	1.150	0.760	0.760
	300	1.950	1.950	1.950	1.950	1.130	1.130	0.970	0.970	0.650	0.650
	500	1.300	1.300	1.300	1.300	0.720	0.720	0.650	0.650	0.430	0.430
	Fx = Fz×0.15**										
	300	2.140	1.420	2.140	1.420	1.330	1.330	1.070	0.710	0.710	0.470
	500	1.530	1.420	1.530	1.420	0.840	0.840	0.760	0.710	0.510	0.470
	300	2.090	2.070	2.090	2.070	2.090	2.070	1.040	1.030	0.690	0.690
	500	2.090	2.070	2.090	2.070	1.410	1.410	1.040	1.030	0.690	0.690
	Fx = Fz×0.15**										
	300	1.600	1.070	1.600	1.070	1.600	1.070	0.800	0.530	0.530	0.350
	500	1.600	1.070	1.600	1.070	1.150	1.070	0.800	0.530	0.530	0.350
	300	4.750	4.750	4.750	4.750	2.370	2.370	2.370	2.370	1.580	1.580
	500	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	0.940	0.940
	Fx = Fz×0.15**										
	300	3.140	2.330	3.140	2.330	1.950	1.950	1.570	1.160	1.040	0.770
	500	2.300	2.300	2.300	2.300	1.150	1.150	1.150	1.150	0.760	0.760
	300	4.350	4.330	4.350	4.330	2.370	2.370	2.170	2.160	1.450	1.440
	500	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	0.940	0.940
	Fx = Fz×0.15**										
	300	1.160	0.770	1.160	0.770	1.160	0.770	0.580	0.380	0.380	0.250
	500	1.160	0.770	1.160	0.770	1.160	0.770	0.580	0.380	0.380	0.250

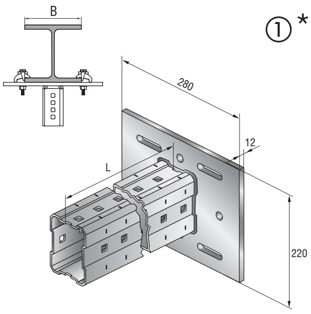
* Fastened to steel beam by way of MI-GC-M12 beam clamps (see individual parts).

** Value for F_Z with simultaneously acting horizontal load F_X, i.e. pipe friction is taken into account.

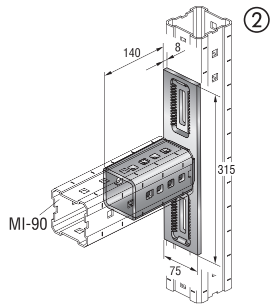
MIC-S120-A welded bracket – Lorraine cross on steel beam



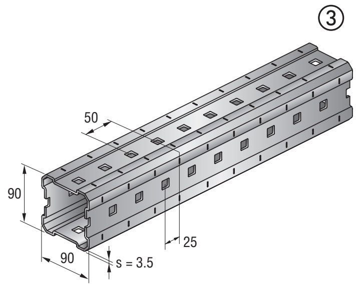
Lorraine cross



MIC-S120-A-[L]



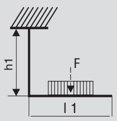
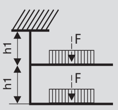
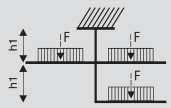
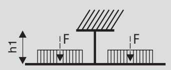
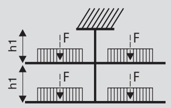
MIC-90-L



MI-90

*** All tablevalues only for showed applications.

Vertical MI-120 girder (recommended working load F_Z [kN])

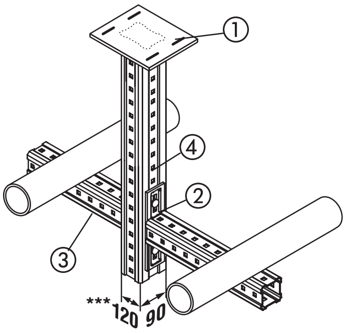
Configuration	Cantilever dimensions [mm]	Loading condition 1 uniform loading ($F_z = q \cdot l$) Fz [kN]			Loading condition 2 single load (½ Fz ½) Fz [kN]			Loading condition 3 (Fz) Fz [kN]			Loading condition 4 (⅓ Fz ⅓ Fz ⅓) Fz [kN]			Loading condition 5 (¼ Fz ¼ Fz ¼ Fz ¼) Fz [kN]		
	l1 \ h1	500	750	1000	500	750	1000	500	750	1000	500	750	1000	500	750	1000
	300	4.590	4.560	4.530	4.590	4.560	4.530	2.370	2.370	2.370	2.290	2.280	2.260	1.530	1.520	1.510
	500	2.820	2.820	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	1.410	1.410	0.940	0.940	0.940
	Fx = Fz × 0.15**															
	300	3.540	3.540	3.540	3.540	3.540	3.540	1.950	1.950	1.950	1.770	1.770	1.770	1.180	1.180	1.180
	500	2.300	2.300	2.300	2.300	2.300	2.300	1.150	1.150	1.150	1.150	1.150	1.150	0.760	0.760	0.760
	300	2.250	2.220	2.180	2.250	2.220	2.180	1.620	1.620	1.620	1.120	1.110	1.090	0.750	0.740	0.720
	500	1.870	1.870	1.870	1.870	1.870	1.870	1.030	1.030	1.030	0.930	0.930	0.930	0.620	0.620	0.620
	Fx = Fz × 0.15**															
	300	1.770	1.770	1.660	1.770	1.770	1.660	1.030	1.030	1.030	0.880	0.880	0.830	0.590	0.590	0.550
	500	1.180	1.180	1.180	1.180	1.180	1.180	0.650	0.650	0.650	0.590	0.590	0.590	0.390	0.390	0.390
	300	2.380	2.360	2.340	2.380	2.360	2.340	2.370	2.360	2.340	1.190	1.180	1.170	0.790	0.780	0.780
	500	2.380	2.360	2.340	2.380	2.360	2.340	1.410	1.410	1.410	1.190	1.180	1.170	0.790	0.780	0.780
	Fx = Fz × 0.15**															
	300	2.130	1.660	1.250	2.130	1.660	1.250	1.950	1.660	1.250	1.060	0.830	0.620	0.710	0.550	0.410
	500	2.110	1.660	1.250	2.110	1.660	1.250	1.150	1.150	1.150	1.050	0.830	0.620	0.700	0.550	0.410
	300	4.750	4.750	4.750	4.750	4.750	4.750	2.370	2.370	2.370	2.370	2.370	2.370	1.580	1.580	1.580
	500	2.820	2.820	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	1.410	1.410	0.940	0.940	0.940
	Fx = Fz × 0.15**															
	300	3.240	3.230	2.500	3.240	3.230	2.500	1.950	1.950	1.950	1.620	1.610	1.250	1.080	1.070	0.830
	500	2.300	2.300	2.300	2.300	2.300	2.300	1.150	1.150	1.150	1.150	1.150	1.150	0.760	0.760	0.760
	300	4.750	4.750	4.750	4.750	4.750	4.750	2.370	2.370	2.370	2.370	2.370	2.370	1.580	1.580	1.580
	500	2.820	2.820	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	1.410	1.410	0.940	0.940	0.940
	Fx = Fz × 0.15**															
	300	1.590	1.110	0.830	1.590	1.110	0.830	1.590	1.110	0.830	0.790	0.550	0.410	0.530	0.370	0.270
	500	1.570	1.110	0.830	1.570	1.110	0.830	1.150	1.110	0.830	0.780	0.550	0.410	0.520	0.370	0.270

* Fastened to steel beam by way of MI-GC-M12 beam clamps (see individual parts).

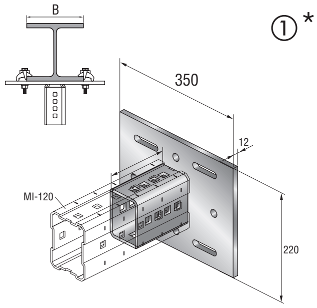
** Value for F_Z with simultaneously acting horizontal load F_X, i.e. pipe friction is taken into account.

[L] Length of bracket: 500 mm, 750 mm or 1000 mm

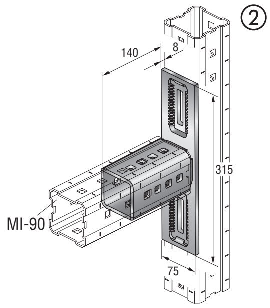
MIC-S120-B Lorraine cross on steel beam



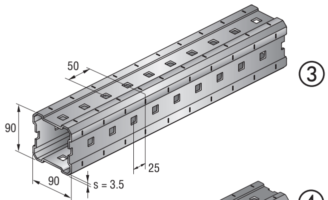
Lorraine cross



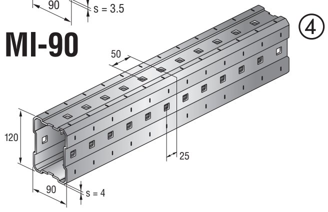
MIC-S120-B



MIC-90-L



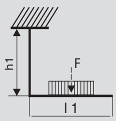
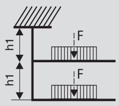
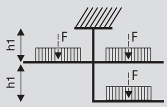
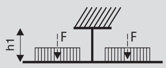
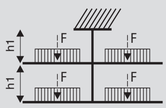
MI-90



MI-120

*** All tablevalues only for showed applications.

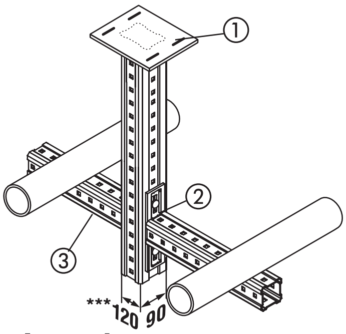
Vertical MI-120 girder (recommended working load F_Z [kN])

Configuration	Cantilever dimensions [mm] l1 \ h1	Loading condition 1 uniform loading ($F_z = q \cdot l$) Fz [kN] 500	750	Loading condition 2 single load (½ Fz ½) Fz [kN] 500	750	Loading condition 3 (Fz) Fz [kN] 500	750	Loading condition 4 (⅓ Fz ⅓ Fz ⅓) Fz [kN] 500	750	Loading condition 5 (¼ Fz ¼ Fz ¼ Fz ¼) Fz [kN] 500	750
	300	3.180	3.180	3.180	3.180	1.850	1.850	1.590	1.590	1.060	1.060
	500	2.130	2.130	2.130	2.130	1.170	1.170	1.060	1.060	0.710	0.710
	Fx = Fz × 0.15** 300	3.840	2.760	3.840	2.760	1.950	1.950	1.920	1.380	1.280	0.920
	500	2.300	2.300	2.300	2.300	1.150	1.150	1.150	1.150	0.760	0.760
	300	1.590	1.590	1.590	1.590	0.920	0.920	0.790	0.790	0.530	0.530
	500	1.060	1.060	1.060	1.060	0.580	0.580	0.530	0.530	0.350	0.350
	Fx = Fz × 0.15** 300	1.380	0.920	1.380	0.920	1.120	0.920	0.690	0.460	0.460	0.300
	500	1.280	0.920	1.280	0.920	0.710	0.710	0.640	0.460	0.420	0.300
	300	2.130	2.110	2.130	2.110	1.850	1.850	1.060	1.050	0.710	0.700
	500	2.130	2.110	2.130	2.110	1.170	1.170	1.060	1.050	0.710	0.700
	Fx = Fz × 0.15** 300	1.030	0.690	1.030	0.690	1.030	0.690	0.510	0.340	0.340	0.230
	500	1.030	0.690	1.030	0.690	1.030	0.690	0.510	0.340	0.340	0.230
	300	4.750	4.750	4.750	4.750	2.370	2.370	2.370	2.370	1.580	1.580
	500	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	0.940	0.940
	Fx = Fz × 0.15** 300	2.250	1.660	2.250	1.660	1.950	1.660	1.120	0.830	0.750	0.550
	500	2.230	1.660	2.230	1.660	1.150	1.150	1.110	0.830	0.740	0.550
	300	2.960	2.940	2.960	2.940	2.370	2.370	1.480	1.470	0.980	0.980
	500	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	0.940	0.940
	Fx = Fz × 0.15** 300	0.830	0.550	0.830	0.550	0.830	0.550	0.410	0.270	0.270	0.180
	500	0.830	0.550	0.830	0.550	0.830	0.550	0.410	0.270	0.270	0.180

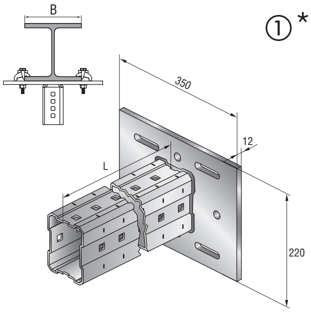
* Fastened to steel beam by way of MI-GC-M12 beam clamps (see individual parts).

** Value for F_Z with simultaneously acting horizontal load F_X, i.e. pipe friction is taken into account.

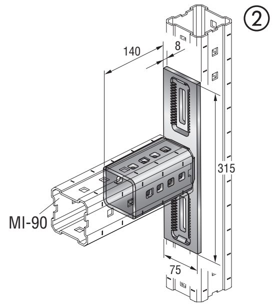
MIC-S120-B welded bracket – Lorraine cross on steel beam



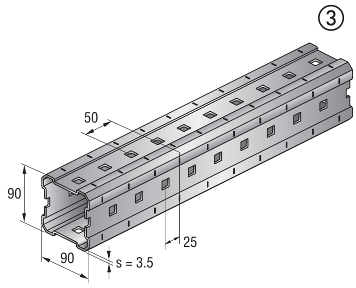
Lorraine cross



MIC-S120-B-[L]



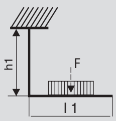
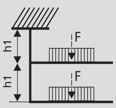
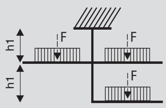
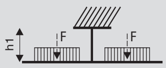
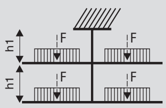
MIC-90-L



MI-90

*** All tablevalues only for showed applications.

Vertical MI-120 girder (recommended working load F_Z [kN])

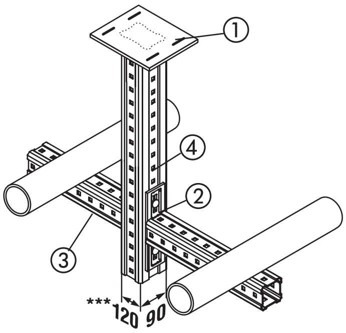
Configuration	Cantilever dimensions [mm]	Loading condition 1 uniform loading ($F_z = q \cdot l$) Fz [kN]			Loading condition 2 single load (½ Fz ½) Fz [kN]			Loading condition 3 Fz [kN]			Loading condition 4 (⅓ Fz ⅓ Fz ⅓) Fz [kN]			Loading condition 5 (¼ Fz ¼ Fz ¼ Fz ¼) Fz [kN]		
	l1 / h1	500	750	1000	500	750	1000	500	750	1000	500	750	1000	500	750	1000
	300	4.160	4.130	4.100	4.160	4.130	4.100	2.370	2.370	2.370	2.080	2.060	2.050	1.380	1.370	1.360
	500	2.820	2.820	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	1.410	1.410	0.940	0.940	0.940
	Fx = Fz×0.15**															
	300	3.030	3.030	3.030	3.030	3.030	3.030	1.760	1.760	1.760	1.510	1.510	1.510	1.010	1.010	1.010
	500	2.020	2.020	2.020	2.020	2.020	2.020	1.120	1.120	1.120	1.010	1.010	1.010	0.670	0.670	0.670
	300	2.030	2.000	1.970	2.030	2.000	1.970	1.330	1.330	1.330	1.010	1.000	0.980	0.670	0.660	0.650
	500	1.530	1.530	1.530	1.530	1.530	1.530	0.840	0.840	0.840	0.760	0.760	0.760	0.510	0.510	0.510
	Fx = Fz×0.15**															
	300	1.510	1.510	1.420	1.510	1.510	1.420	0.880	0.880	0.880	0.750	0.750	0.710	0.500	0.500	0.470
	500	1.010	1.010	1.010	1.010	1.010	1.010	0.560	0.560	0.560	0.500	0.500	0.500	0.330	0.330	0.330
	300	1.740	1.720	1.700	1.740	1.720	1.700	1.740	1.720	1.700	0.870	0.860	0.850	0.580	0.570	0.560
	500	1.740	1.720	1.700	1.740	1.720	1.700	1.410	1.410	1.410	0.870	0.860	0.850	0.580	0.570	0.560
	Fx = Fz×0.15**															
	300	1.700	1.420	1.070	1.700	1.420	1.070	1.700	1.420	1.070	0.850	0.710	0.530	0.560	0.470	0.350
	500	1.680	1.420	1.070	1.680	1.420	1.070	1.120	1.120	1.070	0.840	0.710	0.530	0.560	0.470	0.350
	300	4.750	4.750	4.750	4.750	4.750	4.750	2.370	2.370	2.370	2.370	2.370	2.370	1.580	1.580	1.580
	500	2.820	2.820	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	1.410	1.410	0.940	0.940	0.940
	Fx = Fz×0.15**															
	300	2.600	2.590	2.140	2.600	2.590	2.140	1.950	1.950	1.950	1.300	1.290	1.070	0.860	0.860	0.710
	500	2.300	2.300	2.140	2.300	2.300	2.140	1.150	1.150	1.150	1.150	1.150	1.070	0.760	0.760	0.710
	300	3.410	3.400	3.380	3.410	3.400	3.380	2.370	2.370	2.370	1.700	1.700	1.690	1.130	1.130	1.120
	500	2.820	2.820	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	1.410	1.410	0.940	0.940	0.940
	Fx = Fz×0.15**															
	300	1.270	0.950	0.710	1.270	0.950	0.710	1.270	0.950	0.710	0.630	0.470	0.350	0.420	0.310	0.230
	500	1.250	0.950	0.710	1.250	0.950	0.710	1.150	0.950	0.710	0.620	0.470	0.350	0.410	0.310	0.230

* Fastened to steel beam by way of MI-GC-M12 beam clamps (see individual parts).

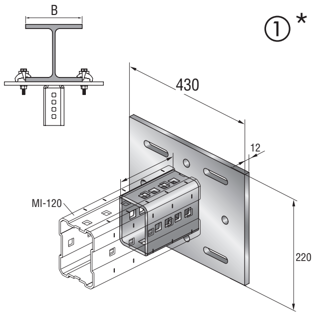
** Value for F_Z with simultaneously acting horizontal load F_X, i.e. pipe friction is taken into account.

[L] Length of bracket: 500 mm, 750 mm or 1000 mm

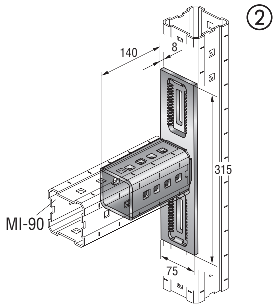
MIC-S120-C Lorraine cross on steel beam



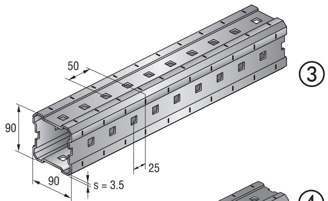
Lorraine cross



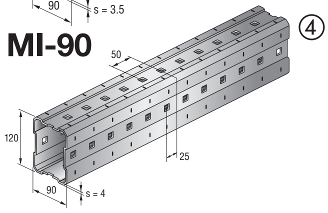
MIC-S120-C



MIC-90-L



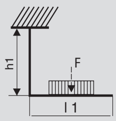
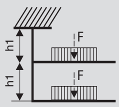
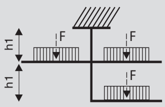
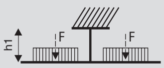
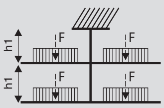
MI-90



MI-120

*** All tablevalues only for showed applications.

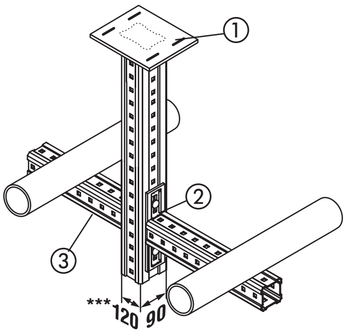
Vertical MI-120 girder (recommended working load F_Z [kN])

Configuration	Cantilever dimensions [mm]	Loading condition 1 uniform loading ($F_z = q \cdot l$) Fz [kN]		Loading condition 2 single load (½ Fz ½) Fz [kN]		Loading condition 3 Fz [kN]		Loading condition 4 (⅓ Fz ⅓ Fz ⅓) Fz [kN]		Loading condition 5 (¼ Fz ¼ Fz ¼ Fz ¼) Fz [kN]	
	l1 \ h1	500	750	500	750	500	750	500	750	500	750
	300	3.640	3.640	3.640	3.640	2.120	2.120	1.820	1.820	1.210	1.210
	500	2.440	2.440	2.440	2.440	1.350	1.350	1.220	1.220	0.810	0.810
	Fx=Fz×0.15** 300	3.230	2.380	3.230	2.380	1.880	1.880	1.610	1.190	1.070	0.790
	500	2.160	2.160	2.160	2.160	1.150	1.150	1.080	1.080	0.720	0.720
	300	1.820	1.820	1.820	1.820	1.060	1.060	0.910	0.910	0.600	0.600
	500	1.220	1.220	1.220	1.220	0.670	0.670	0.610	0.610	0.400	0.400
	Fx=Fz×0.15** 300	1.190	0.790	1.190	0.790	0.940	0.790	0.590	0.390	0.390	0.260
	500	1.080	0.790	1.080	0.790	0.590	0.590	0.540	0.390	0.360	0.260
	300	1.240	1.220	1.240	1.220	1.240	1.220	0.620	0.610	0.410	0.400
	500	1.240	1.220	1.240	1.220	1.240	1.220	0.620	0.610	0.410	0.400
	Fx=Fz×0.15** 300	0.890	0.590	0.890	0.590	0.890	0.590	0.440	0.290	0.290	0.190
	500	0.890	0.590	0.890	0.590	0.890	0.590	0.440	0.290	0.290	0.190
	300	4.260	4.250	4.260	4.250	2.370	2.370	2.130	2.120	1.420	1.410
	500	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	0.940	0.940
	Fx=Fz×0.15** 300	1.830	1.330	1.830	1.330	1.830	1.330	0.910	0.660	0.610	0.440
	500	1.810	1.330	1.810	1.330	1.150	1.150	0.900	0.660	0.600	0.440
	300	2.100	2.080	2.100	2.080	2.100	2.080	1.050	1.040	0.700	0.690
	500	2.080	2.060	2.080	2.060	1.410	1.410	1.040	1.030	0.690	0.680
	Fx=Fz×0.15** 300	0.660	0.440	0.660	0.440	0.660	0.440	0.330	0.220	0.220	0.140
	500	0.660	0.440	0.660	0.440	0.660	0.440	0.330	0.220	0.220	0.140

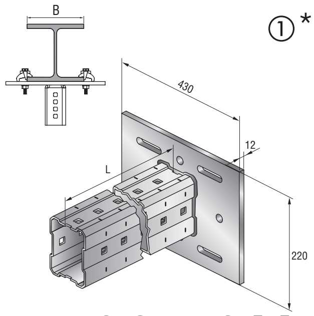
* Fastened to steel beam by way of MI-GC-M12 beam clamps (see individual parts).

** Value for F_Z with simultaneously acting horizontal load F_X, i.e. pipe friction is taken into account.

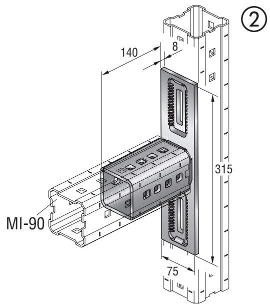
MIC-S120-C welded bracket – Lorraine cross on steel beam



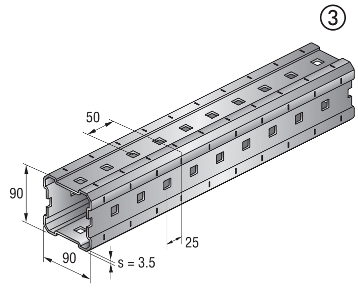
Lorraine cross



MIC-S120-C-[L]



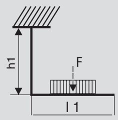
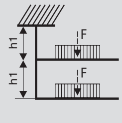
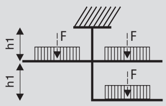
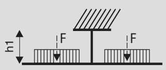
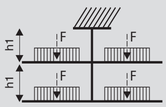
MIC-90-L



MI-90

*** All tablevalues only for showed applications.

Vertical MI-120 girder (recommended working load F_Z [kN])

Configuration	Cantilever dimensions [mm]	Loading condition 1 uniform loading ($F_Z = q \cdot l$) Fz [kN]			Loading condition 2 single load (½ Fz ½) Fz [kN]			Loading condition 3 Fz [kN]			Loading condition 4 (⅓ Fz ⅓ Fz ⅓) Fz [kN]			Loading condition 5 (¼ Fz ¼ Fz ¼ Fz ¼) Fz [kN]		
	l1 \ h1	500	750	1000	500	750	1000	500	750	1000	500	750	1000	500	750	1000
	300	3.030	3.030	3.030	3.030	3.030	3.030	1.760	1.760	1.760	1.510	1.510	1.510	1.010	1.010	1.010
	500	2.020	2.020	2.020	2.020	2.020	2.020	1.120	1.120	1.120	1.010	1.010	1.010	0.670	0.670	0.670
	Fx = Fz×0.15**															
	300	2.520	2.520	2.520	2.520	2.520	2.520	1.470	1.470	1.470	1.260	1.260	1.260	0.840	0.840	0.840
	500	1.680	1.680	1.680	1.680	1.680	1.680	0.930	0.930	0.930	0.840	0.840	0.840	0.560	0.560	0.560
	300	1.510	1.510	1.510	1.510	1.510	1.510	0.880	0.880	0.880	0.750	0.750	0.750	0.500	0.500	0.500
	500	1.010	1.010	1.010	1.010	1.010	1.010	0.560	0.560	0.560	0.500	0.500	0.500	0.330	0.330	0.330
	Fx = Fz×0.15**															
	300	1.260	1.260	1.190	1.260	1.260	1.190	0.730	0.730	0.730	0.630	0.630	0.590	0.420	0.420	0.390
	500	0.840	0.840	0.840	0.840	0.840	0.840	0.460	0.460	0.460	0.420	0.420	0.420	0.280	0.280	0.280
	300	1.590	1.570	1.550	1.590	1.570	1.550	1.590	1.570	1.550	0.790	0.780	0.770	0.530	0.520	0.510
	500	1.590	1.570	1.550	1.590	1.570	1.550	1.120	1.120	1.120	0.790	0.780	0.770	0.530	0.520	0.510
	Fx = Fz×0.15**															
	300	1.270	1.190	0.890	1.270	1.190	0.890	1.270	1.190	0.890	0.630	0.590	0.440	0.420	0.390	0.290
	500	1.250	1.190	0.890	1.250	1.190	0.890	0.930	0.930	0.890	0.620	0.590	0.440	0.410	0.390	0.290
	300	4.750	4.750	4.750	4.750	4.750	4.750	2.370	2.370	2.370	2.370	2.370	2.370	1.580	1.580	1.580
	500	2.820	2.820	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	1.410	1.410	0.940	0.940	0.940
	Fx = Fz×0.15**															
	300	1.960	1.940	1.780	1.960	1.940	1.780	1.950	1.940	1.780	0.980	0.970	0.890	0.650	0.640	0.590
	500	1.940	1.920	1.780	1.940	1.920	1.780	1.150	1.150	1.150	0.970	0.960	0.890	0.640	0.640	0.590
	300	2.370	2.350	2.330	2.370	2.350	2.330	2.370	2.350	2.330	1.180	1.170	1.160	0.970	0.780	0.770
	500	2.350	2.330	2.320	2.330	2.330	2.320	1.410	1.410	1.410	1.170	1.160	1.160	0.780	0.770	0.770
	Fx = Fz×0.15**															
	300	0.950	0.790	0.590	0.950	0.790	0.590	0.950	0.790	0.590	0.470	0.390	0.290	0.310	0.260	0.190
	500	0.930	0.790	0.590	0.930	0.790	0.590	0.930	0.790	0.590	0.460	0.390	0.290	0.310	0.260	0.190

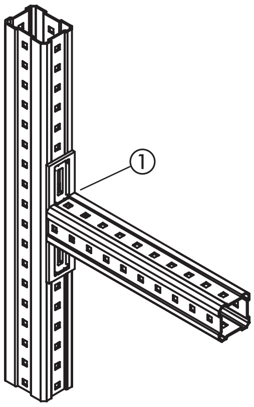
* Fastened to steel beam by way of MI-GC-M12 beam clamps (see individual parts).

** Value for F_Z with simultaneously acting horizontal load F_X, i.e. pipe friction is taken into account.

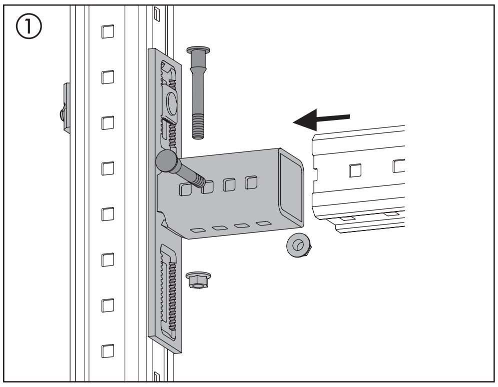
[L] Length of bracket: 500 mm, 750 mm or 1000 mm

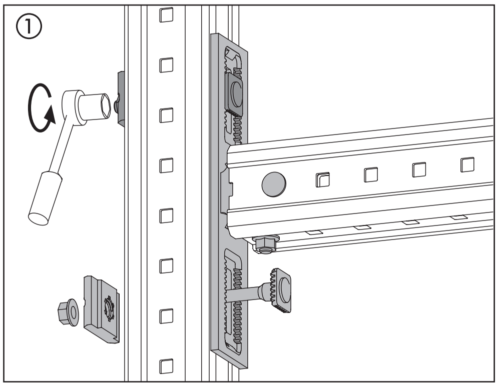
Unsupported cantilever: General points

MI girder

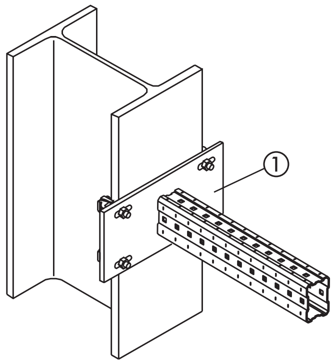


MIC-90-L

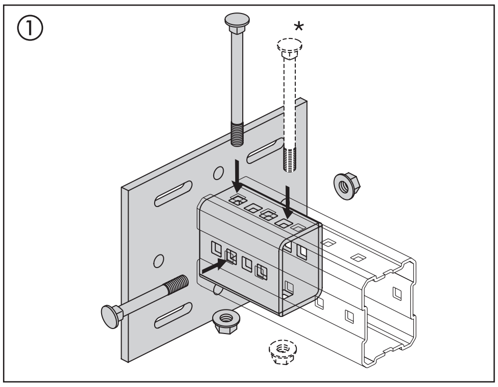




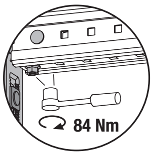
Steel beam

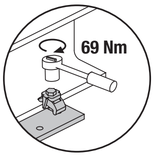


MIC-S90-A/B/C / MIC-S120-A/B/C



The MI connectors must always make full contact with the MI girder. The bolts should be fitted as close as possible to the fastening plate. (Also see instructions on page 5.8.)
* In some cases, a higher load value can be achieved through use of a third bolt (see load tables). The bolt should be fitted in the direction of the horizontal force.
Note! The third bolt must be ordered additionally.

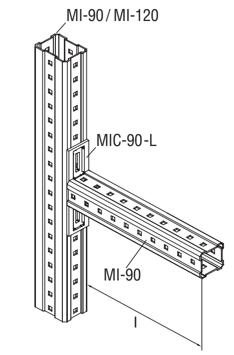


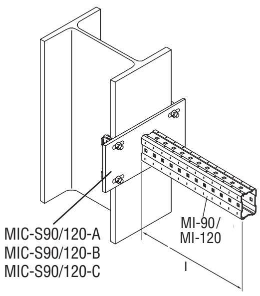


Bolt tightening torque: For connectors For beam clamps

Unsupported cantilever MI-90 / 120

Recommended working load F_Z [kN]





Connection by way of	Cantilever length l [mm]	Loading condition 1 ($F_Z = q \cdot l$) uniform loading Fz [kN]	Loading condition 2 single load Fz [kN]	Loading condition 3 Fz [kN]	Loading condition 4 Fz [kN]	Loading condition 5 Fz [kN]
MIC-90-L	300	4.750	4.750	2.370	2.370	1.580
MIC-90-L	500	2.820	2.820	1.410	1.410	0.940
MIC-90-L	1000	1.340	1.340	0.670	0.670	0.440
Fx = Fz × 0.15**						
MIC-90-L	300	3.900	3.900	1.950	1.950	1.300
MIC-90-L	500	2.300	2.300	1.150	1.150	0.760
MIC-90-L	1000	1.080	1.080	0.540	0.540	0.360
MIC-S90-A / B / C	500	2.820 (3.720)	2.820 (3.720)	1.410 (1.860)	1.410 (1.860)	0.940 (1.240)
MIC-S90-A / B / C	1000	1.340 (1.790)	1.340 (1.790)	0.670 (0.890)	0.670 (0.890)	0.440 (0.590)
Fx = Fz × 0.15**						
MIC-S90-A / B / C	500	2.820 (3.380)	2.820 (3.380)	1.410 (1.690)	1.410 (1.690)	0.940 (1.120)
MIC-S90-A / B / C	1000	1.340 (1.610)	1.340 (1.610)	0.670 (0.800)	0.670 (0.800)	0.440 (0.530)
MIC-S120-A / B / C	500	3.920 (4.650)	3.920 (4.650)	1.960 (2.320)	1.960 (2.320)	1.300 (1.550)
MIC-S120-A / B / C	1000	1.860 (2.230)	1.860 (2.230)	0.930 (1.110)	0.930 (1.110)	0.620 (0.740)
Fx = Fz × 0.15**						
MIC-S120-A / B / C	500	3.920 (4.220)	3.920 (4.220)	1.960 (2.110)	1.960 (2.110)	1.300 (1.400)
MIC-S120-A / B / C	1000	1.860 (2.010)	1.860 (2.010)	0.930 (1.000)	0.930 (1.000)	0.620 (0.670)

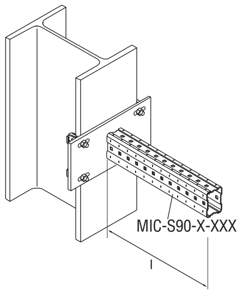
Design values = recommended loads * 1.4

Connectors
Connection to steel beam: Four MI-GC-M12 beam clamps (see individual parts).

* Values in brackets () apply to the use of three bolts (second bolt in the direction of the vertical load).
** Value for F_Z with simultaneously acting horizontal load F_X, i.e. pipe friction is taken into account.

Unsupported cantilever – welded bracket MI-90

Recommended working load F_Z [kN]



Connection by way of	Cantilever length l [mm]	$F_z = q \cdot l$ Loading condition 1 uniform loading Fz [kN]	Loading condition 2 single load Fz [kN]	Loading condition 3 Fz [kN]	Loading condition 4 Fz [kN]	Loading condition 5 Fz [kN]
MIC-S90-A-500	500	4.660	4.660	2.970	2.970	1.980
MIC-S90-A-750	750	3.920	3.920	1.960	1.960	1.300
MIC-S90-A-1000	1000	2.900	2.900	1.450	1.450	0.960
Fx = Fz × 0.15*						
MIC-S90-A-500	500	4.660	4.660	2.330	2.330	1.550
MIC-S90-A-750	750	3.070	3.070	1.530	1.530	1.020
MIC-S90-A-1000	1000	2.260	2.260	1.130	1.130	0.750
MIC-S90-B-500	500	4.660	4.660	2.970	2.970	1.980
MIC-S90-B-750	750	3.920	3.920	1.960	1.960	1.300
MIC-S90-B-1000	1000	2.900	2.900	1.450	1.450	0.960
Fx = Fz × 0.15*						
MIC-S90-B-500	500	3.800	3.800	1.900	1.900	1.260
MIC-S90-B-750	750	2.500	2.500	1.250	1.250	0.830
MIC-S90-B-1000	1000	1.830	1.830	0.910	0.910	0.610
MIC-S90-C-500	500	4.230	4.230	2.110	2.110	1.410
MIC-S90-C-750	750	2.780	2.780	1.390	1.390	0.920
MIC-S90-C-1000	1000	2.040	2.040	1.020	1.020	0.680
Fx = Fz × 0.15*						
MIC-S90-C-500	500	3.800	3.800	1.900	1.900	1.260
MIC-S90-C-750	750	2.500	2.500	1.250	1.250	0.830
MIC-S90-C-1000	1000	1.830	1.830	0.910	0.910	0.610

Design values = recommended loads * 1.4

Connectors

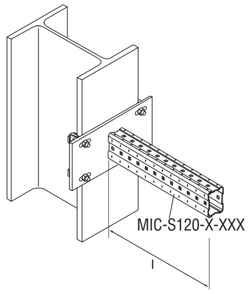
Connection to steel beam: Four MI-GC-M12 beam clamps (see individual parts).

* Values in brackets () apply to the use of three bolts (second bolt in the direction of the vertical load).

** Value for F_Z with simultaneously acting horizontal load F_X, i.e. pipe friction is taken into account.

Unsupported cantilever – welded bracket MI-120

Recommended working load F_z [kN]



Connection by way of	Cantilever length l [mm]	$F_z = q \cdot l$ Loading condition 1 uniform loading Fz [kN]	Loading condition 2 single load Fz [kN]	Loading condition 3 Fz [kN]	Loading condition 4 Fz [kN]	Loading condition 5 Fz [kN]
MIC-S120-A-500	500	4.640	4.640	3.610	3.610	2.400
MIC-S120-A-750	750	4.640	4.640	2.380	2.380	1.580
MIC-S120-A-1000	1000	3.510	3.510	1.750	1.750	1.170
Fx = Fz × 0.15*						
MIC-S120-A-500	500	4.640	4.640	2.320	2.320	1.550
MIC-S120-A-750	750	3.040	3.040	1.520	1.520	1.010
MIC-S120-A-1000	1000	2.230	2.230	1.110	1.110	0.740
MIC-S120-B-500	500	4.640	4.640	2.960	2.960	1.970
MIC-S120-B-750	750	3.900	3.900	1.950	1.950	1.300
MIC-S120-B-1000	1000	2.870	2.870	1.430	1.430	0.950
Fx = Fz × 0.15*						
MIC-S120-B-500	500	4.640	4.640	2.320	2.320	1.550
MIC-S120-B-750	750	3.040	3.040	1.520	1.520	1.010
MIC-S120-B-1000	1000	2.230	2.230	1.110	1.110	0.740
MIC-S120-C-500	500	4.640	4.640	2.320	2.320	1.550
MIC-S120-C-750	750	3.040	3.040	1.520	1.520	1.010
MIC-S120-C-1000	1000	2.230	2.230	1.110	1.110	0.740
Fx = Fz × 0.15*						
MIC-S120-C-500	500	4.220	4.220	2.110	2.110	1.400
MIC-S120-C-750	750	2.760	2.760	1.380	1.380	0.920
MIC-S120-C-1000	1000	2.010	2.010	1.000	1.000	0.670

Design values = recommended loads * 1.4

Connectors

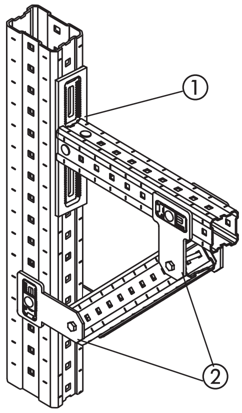
Connection to steel beam: Four MI-GC-M12 beam clamps (see individual parts).

* Values in brackets () apply to the use of three bolts (second bolt in the direction of the vertical load).

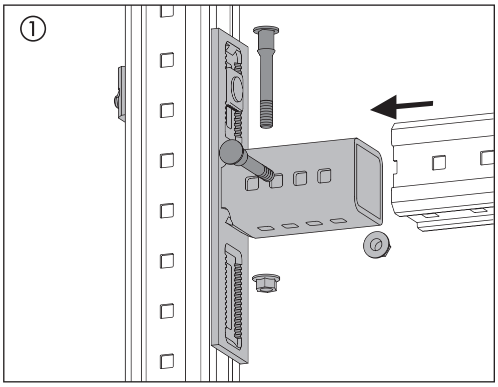
** Value for F_Z with simultaneously acting horizontal load F_X, i.e. pipe friction is taken into account.

Supported cantilever: General points

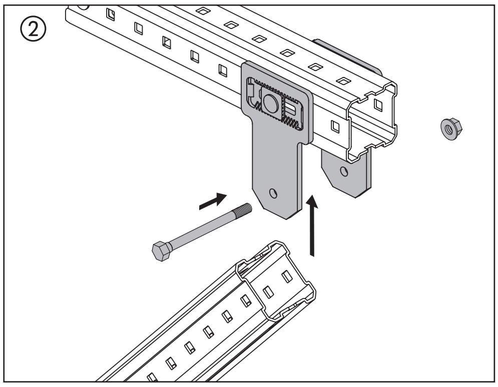
MI girder



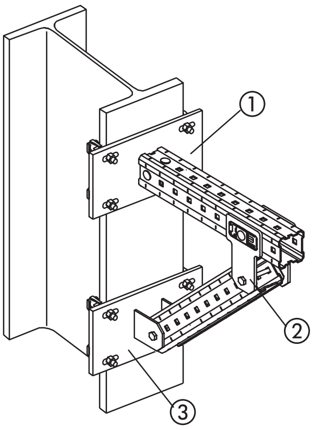
MIC-90-L



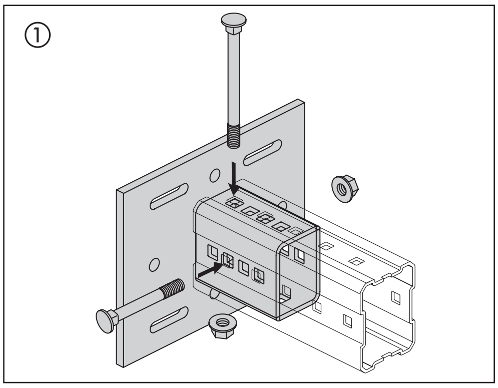
MIC-T



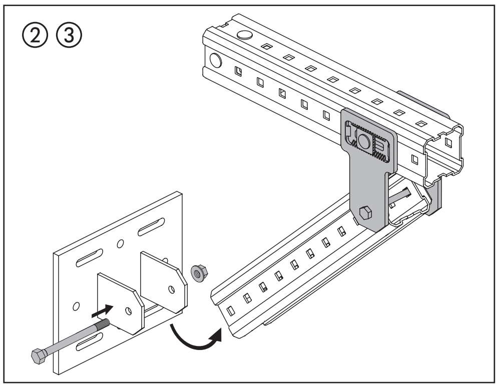
Steel beam



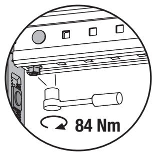
MIC-S90 / MIC-S120-A / B / C

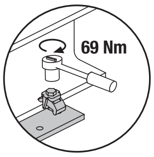


MIC-T; MIC-SA / SB / SC-MA



The MI connectors must always make full contact with the MI girder.
The bolts should be fitted as close as possible to the fastening plate. (Also see instructions on page 5.8.)

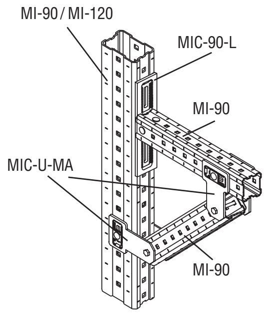


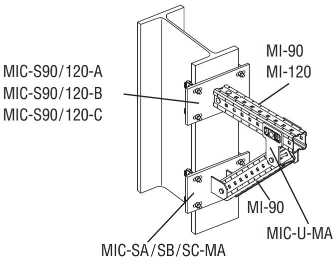


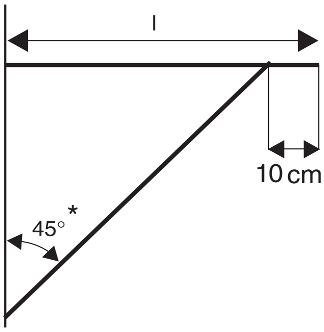
Bolt tightening torque: For connectors For beam clamps

Supported cantilever MI-90 / 120

Recommended working load F_z [kN]







Connection by way of	Cantilever length l [mm]	Loading condition 1 ($F_z = q \cdot i$) Fz [kN]	Loading condition 2 (½ Fz ½) Fz [kN]	Loading condition 3 (Fz) Fz [kN]	Loading condition 4 (⅓ Fz ⅓ Fz ⅓) Fz [kN]	Loading condition 5 (¼ Fz ¼ Fz ¼ Fz ¼) Fz [kN]
Fz						
MIC-90-L, MIC-U-MA	500	12.010	12.010	6.000	6.000	4.000
MIC-90-L, MIC-U-MA	1000	13.420	13.420	6.710	6.710	4.470
Fx = Fz × 0.15**						
MIC-90-L, MIC-U-MA	500	2.290	2.290	1.140	1.140	0.760
MIC-90-L, MIC-U-MA	1000	1.420	1.420	0.710	0.710	0.470
Fz						
MIC-S90/120-A, MIC-U-MA, MIC-SA-MA	500	10.150	10.150	5.070	5.070	3.380
MIC-S90/120-A, MIC-U-MA, MIC-SA-MA	1000	11.300	11.300	5.650	5.650	3.760
Fx = Fz × 0.15**						
MIC-S90/120-A, MIC-U-MA, MIC-SA-MA	500	9.840	9.840	4.920	4.920	3.280
MIC-S90/120-A, MIC-U-MA, MIC-SA-MA	1000	9.570	9.570	4.780	4.780	3.190
Fz						
MIC-S90/120-B, MIC-U-MA, MIC-SB-MA	500	10.150	10.150	5.070	5.070	3.380
MIC-S90/120-B, MIC-U-MA, MIC-SB-MA	1000	11.300	11.300	5.650	5.650	3.760
Fx = Fz × 0.15**						
MIC-S90/120-B, MIC-U-MA, MIC-SB-MA	500	8.010	8.010	4.000	4.000	2.670
MIC-S90/120-B, MIC-U-MA, MIC-SB-MA	1000	8.880	8.880	4.440	4.440	2.690
Fz						
MIC-S90/120-C, MIC-U-MA, MIC-SC-MA	500	10.150	10.150	5.070	5.070	3.380
MIC-S90/120-C, MIC-U-MA, MIC-SC-MA	1000	11.300	11.300	5.650	5.650	3.760
Fx = Fz × 0.15**						
MIC-S90/120-C, MIC-U-MA, MIC-SC-MA	500	6.480	6.480	3.240	3.240	2.160
MIC-S90/120-C, MIC-U-MA, MIC-SC-MA	1000	7.170	7.170	3.580	3.580	2.390

Design values = recommended loads * 1.4

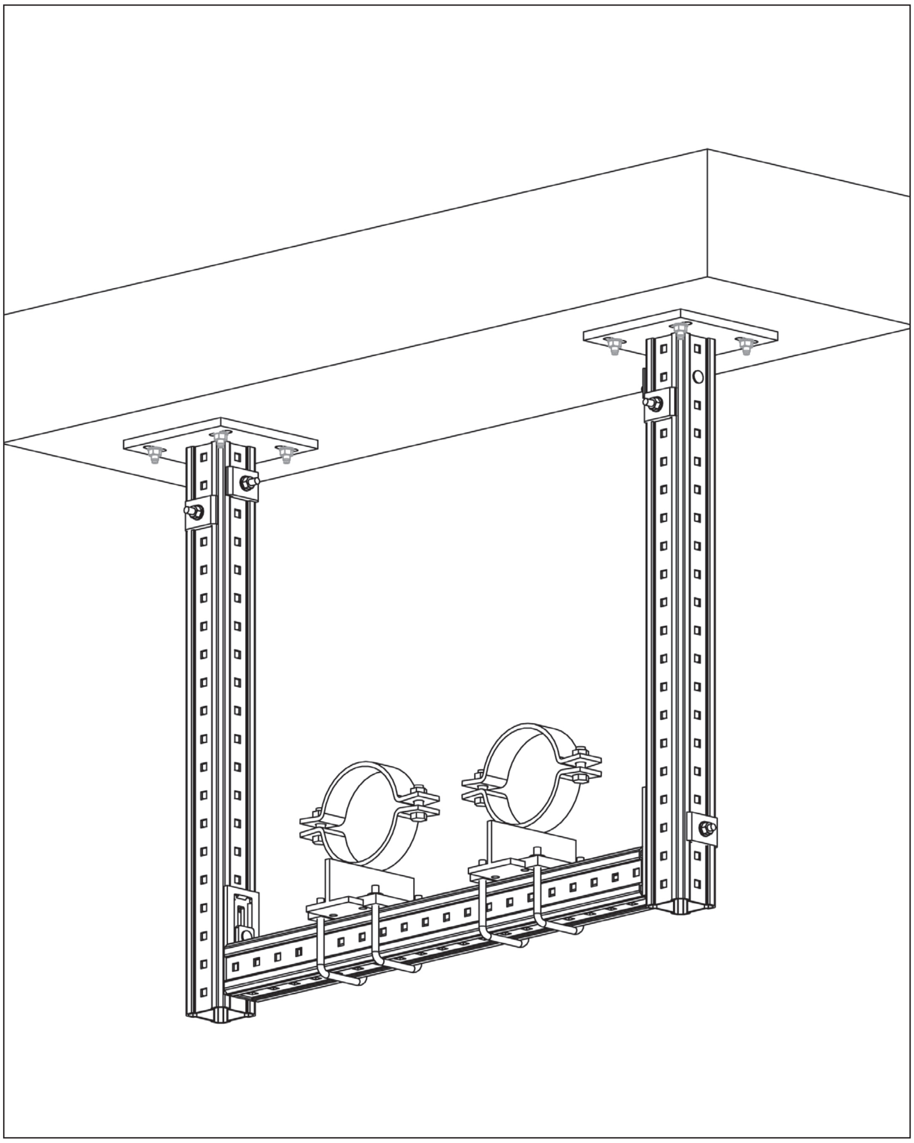
Connectors

Connection to steel beam: Eight MI-GC-M12 beam clamps (see individual parts).

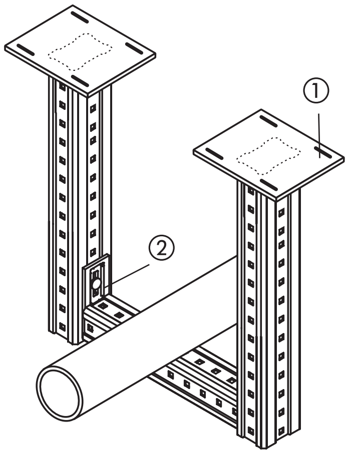
* The recommended load is given for an angle of 45°. The components permit angles of 0–180°. Please contact our technical consultants for details of design values when angles other than 45° are used.

** Value for F_Z with simultaneously acting horizontal load F_X, i.e. pipe friction is taken into account.

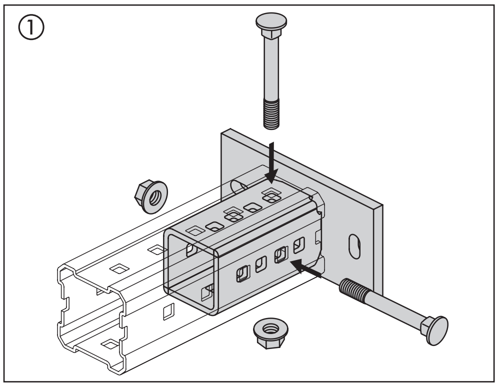
MI System applications - connections to concrete

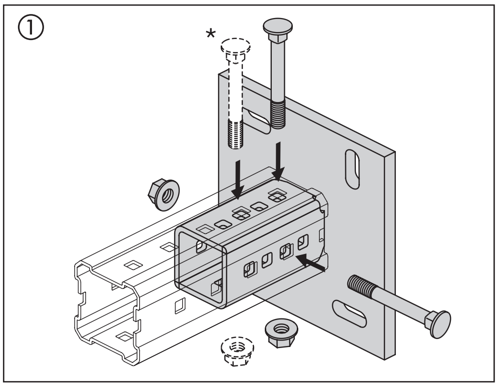


U-frames: General points

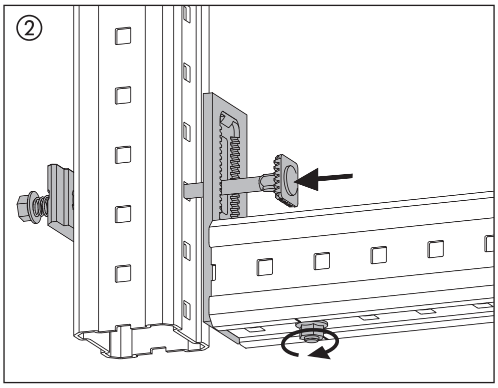


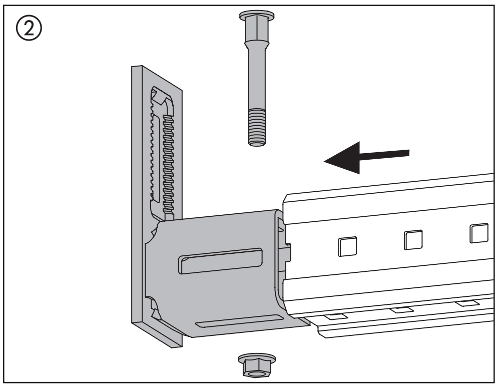
Connections to concrete: MIC-C90-AA, MIC-C90/120-D



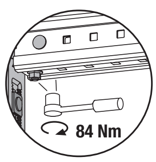


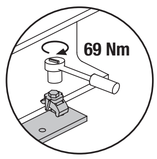
MI connector: MIC-90/120-U





The MI connector must always make full contact with the MI girder. The bolts should be fitted as close as possible to the fastening plate. (Also see instructions on page 5.8.)
* In some cases, a higher load value can be achieved through use of a third bolt (see load tables). The bolt should be fitted in the direction of the horizontal force.
Note: The third bolt must be ordered additionally.

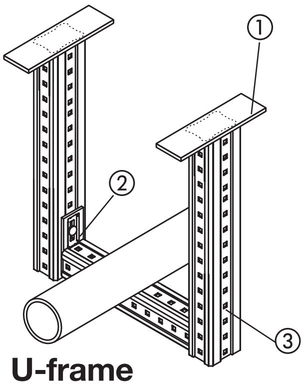




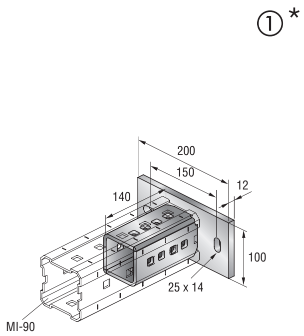
Bolt tightening torque: For connectors For beam clamps

MIC-C90-AA U-frames on concrete

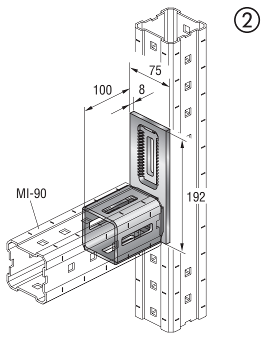
Crossbeam simply supported, columns restrained



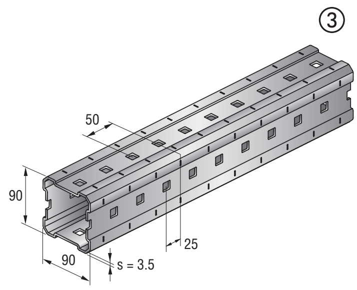
U-frame



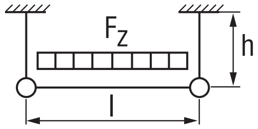
MIC-C90-AA



MIC-90-U



MI-90

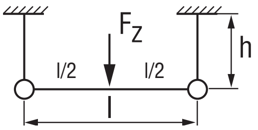


Uniformly distributed load

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	18.39	18.36	18.34	17.72	15.31	12.04	9.69	7.94	6.61
500	Fz + Fx **	7.01	6.99	6.96	6.94	6.92	6.89	6.87	6.85	6.61
1000	Fz + Fx **	5.71	5.71	5.71	5.71	5.71	5.71	5.71	5.71	5.71
1500	Fz + Fx **	3.81	3.81	3.81	3.81	3.81	3.81	3.81	3.81	3.81
2000	Fz + Fx **	2.86	2.86	2.86	2.86	2.86	2.86	2.86	2.86	2.86

*Fx = Fz × 0.15 ****

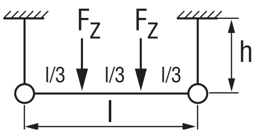


1 single load

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	15.53	12.42	10.34	8.85	7.72	6.84	6.05	4.96	4.13
500	Fz + Fx **	7.01	6.99	6.96	6.94	6.72	5.95	5.34	4.84	4.13
1000	Fz + Fx **	5.71	5.71	5.71	5.71	5.71	5.71	5.34	4.84	4.13
1500	Fz + Fx **	3.81	3.81	3.81	3.81	3.81	3.81	3.81	3.81	3.81
2000	Fz + Fx **	2.86	2.86	2.86	2.86	2.86	2.86	2.86	2.86	2.86

*Fx = Fz × 0.15 ****

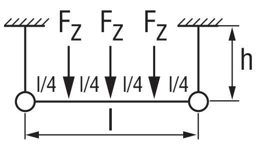


2 single loads

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	9.19	9.18	7.74	6.62	5.62	4.42	3.55	2.91	2.42
500	Fz + Fx **	3.51	3.49	3.48	3.47	3.46	3.45	3.43	2.91	2.42
1000	Fz + Fx **	2.86	2.86	2.86	2.86	2.86	2.86	2.86	2.86	2.42
1500	Fz + Fx **	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90
2000	Fz + Fx **	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43

*Fx = Fz × 0.15 ****

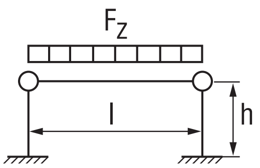


3 single loads

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	6.13	6.12	5.19	4.45	3.90	3.22	2.60	2.15	1.81
500	Fz + Fx **	2.34	2.33	2.32	2.31	2.31	2.30	2.29	2.15	1.81
1000	Fz + Fx **	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.81
1500	Fz + Fx **	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
2000	Fz + Fx **	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95

*Fx = Fz × 0.15 ****



All structures listed can also be used standing (see illustrations)

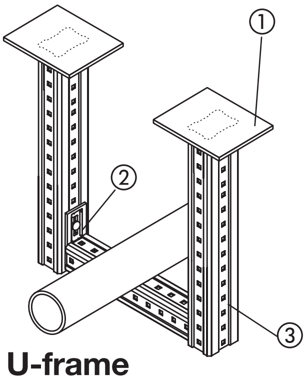
* Fastened to concrete by way of approved Hilti anchors of the type HST (R) M12; alternative approved Hilti anchors are the HDA, HVZ and HIT-TZ of the same nominal diameter and same version

** Value for F_Z with simultaneously acting horizontal load F_X

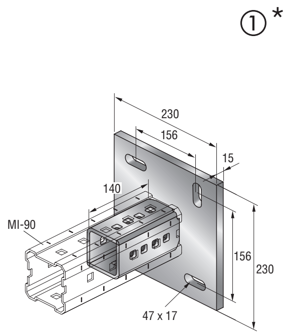
*** Applies to all values for $F_Z + F_X$, i.e. pipe friction is taken into account

MIC-C90-D U-frames on concrete

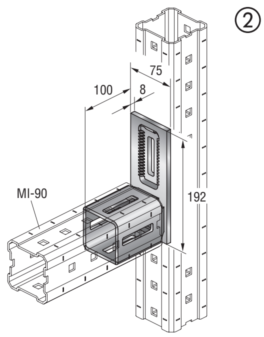
Crossbeam simply supported, columns restrained



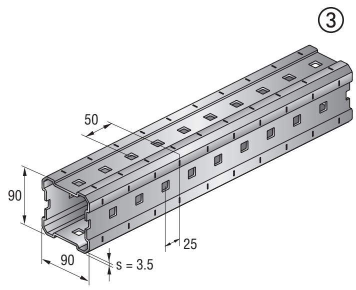
U-frame



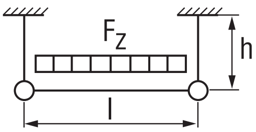
MIC-C90-D



MIC-90-U



MI-90

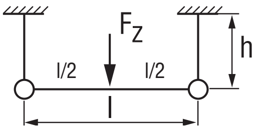


Uniformly distributed load

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	25.24	24.91	20.72	17.72	15.32	12.05	9.70	7.95	6.62
500	Fz + (Fx // Fy)**	13.81	13.79	13.76	13.74	13.45	11.92	9.70	7.95	6.62
1000	Fz + (Fx // Fy)**	9.57	9.57	9.57	9.57	9.57	9.57	9.57	7.95	6.62
1500	Fz + (Fx // Fy)**	6.38	6.38	6.38	6.38	6.38	6.38	6.38	6.38	6.38
2000	Fz + (Fx // Fy)**	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79

*Fx = Fy = Fz × 0.15 ****

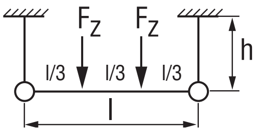


1 single load

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	15.53	12.42	10.34	8.85	7.72	6.85	6.06	4.97	4.14
500	Fz + (Fx // Fy)**	13.52	10.81	9.00	7.70	6.72	5.95	5.34	4.84	4.14
1000	Fz + (Fx // Fy)**	9.57	9.57	9.00	7.70	6.72	5.95	5.34	4.84	4.14
1500	Fz + (Fx // Fy)**	6.38	6.38	6.38	6.38	6.38	5.95	5.34	4.84	4.14
2000	Fz + (Fx // Fy)**	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.14

*Fx = Fy = Fz × 0.15 ****

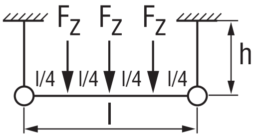


2 single loads

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	11.59	9.29	7.74	6.62	5.62	4.42	3.56	2.92	2.43
500	Fz + (Fx // Fy)**	6.91	6.89	6.74	5.77	5.03	4.42	3.56	2.92	2.43
1000	Fz + (Fx // Fy)**	4.79	4.79	4.79	4.79	4.79	4.42	3.56	2.92	2.43
1500	Fz + (Fx // Fy)**	3.19	3.19	3.19	3.19	3.19	3.19	3.19	2.92	2.43
2000	Fz + (Fx // Fy)**	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39

*Fx = Fy = Fz × 0.15 ****

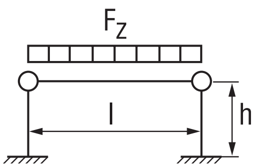


3 single loads

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	7.75	6.22	5.19	4.45	3.90	3.22	2.60	2.15	1.81
500	Fz + (Fx // Fy)**	4.60	4.60	4.52	3.87	3.39	3.01	2.60	2.15	1.81
1000	Fz + (Fx // Fy)**	3.19	3.19	3.19	3.19	3.19	3.01	2.60	2.15	1.81
1500	Fz + (Fx // Fy)**	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13	1.81
2000	Fz + (Fx // Fy)**	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60

*Fx = Fy = Fz × 0.15 ****



All structures listed can also be used standing (see illustrations)

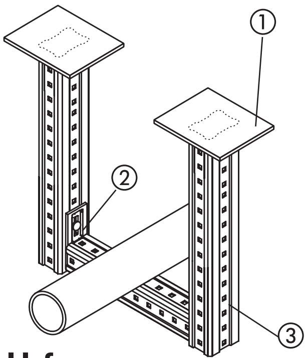
* Fastened to concrete by way of approved Hilti anchors of the type HST (R) M12; alternative approved Hilti anchors are the HDA, HVZ and HIT-TZ of the same nominal diameter and same version

** Value for F_Z with simultaneously acting horizontal load F_X or F_Y

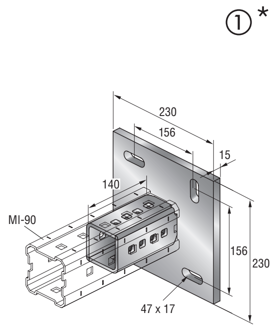
*** Applies to all values for Fz + Fx // Fy, i.e. pipe friction is taken into account (// = or)

MIC-C90-D U-frames on concrete (3 bolts****)

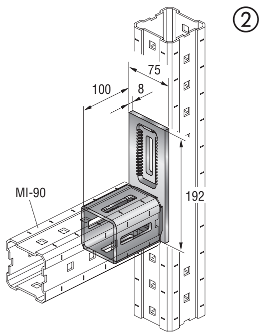
Crossbeam simply supported, columns restrained



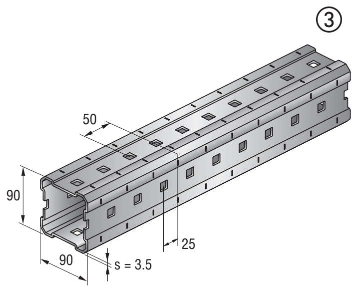
U-frame



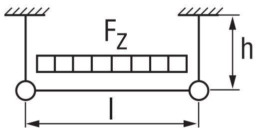
MIC-C90-D



MIC-90-U



MI-90

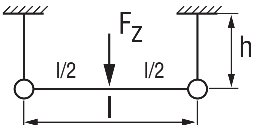


Uniformly distributed load

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	25.24	24.91	20.72	17.72	15.31	12.04	9.69	7.95	6.62
500	Fz + (Fx // Fy)**	13.81	13.79	13.76	13.63	11.90	10.54	9.46	7.95	6.62
1000	Fz + (Fx // Fy)**	12.57	12.57	12.57	12.57	11.90	10.54	9.46	7.95	6.62
1500	Fz + (Fx // Fy)**	8.38	8.38	8.38	8.38	8.38	8.38	8.38	7.95	6.62
2000	Fz + (Fx // Fy)**	6.29	6.29	6.29	6.29	6.29	6.29	6.29	6.29	6.29

*Fx = Fy = Fz × 0.15 ****

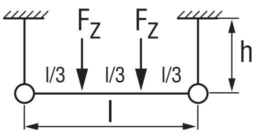


1 single load

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	15.53	12.42	10.34	8.85	7.72	6.84	6.05	4.96	4.13
500	Fz + (Fx // Fy)**	11.97	9.57	7.96	6.81	5.94	5.27	4.73	4.28	3.91
1000	Fz + (Fx // Fy)**	11.97	9.57	7.96	6.81	5.94	5.27	4.73	4.28	3.91
1500	Fz + (Fx // Fy)**	8.38	8.38	7.96	6.81	5.94	5.27	4.73	4.28	3.91
2000	Fz + (Fx // Fy)**	6.29	6.29	6.29	6.29	5.94	5.27	4.73	4.28	3.91

*Fx = Fy = Fz × 0.15 ****

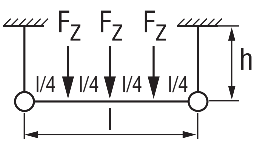


2 single loads

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	11.59	9.29	7.74	6.62	5.62	4.42	3.55	2.91	2.42
500	Fz + (Fx // Fy)**	6.91	6.89	5.96	5.10	4.46	3.95	3.54	2.92	2.43
1000	Fz + (Fx // Fy)**	6.29	6.29	5.96	5.10	4.46	3.95	3.54	2.92	2.43
1500	Fz + (Fx // Fy)**	4.19	4.19	4.19	4.19	4.19	3.95	3.54	2.92	2.43
2000	Fz + (Fx // Fy)**	3.14	3.14	3.14	3.14	3.14	3.14	3.14	2.92	2.43

*Fx = Fy = Fz × 0.15 ****

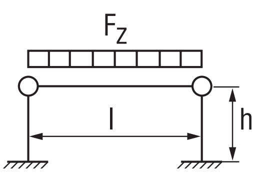


3 single loads

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	7.75	6.22	5.19	4.45	3.90	3.22	2.60	2.15	1.81
500	Fz + (Fx // Fy)**	4.60	4.60	4.00	3.43	3.00	2.67	2.40	2.15	1.81
1000	Fz + (Fx // Fy)**	4.19	4.19	4.00	3.43	3.00	2.67	2.40	2.15	1.81
1500	Fz + (Fx // Fy)**	2.79	2.79	2.79	2.79	2.79	2.67	2.40	2.15	1.81
2000	Fz + (Fx // Fy)**	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	1.81

*Fx = Fy = Fz × 0.15 ****



All structures listed can also be used standing (see illustrations)

* Fastened to concrete by way of approved Hilti anchors of the type HST (R) M12; alternative approved Hilti anchors are the HDA, HVZ and HIT-TZ of the same nominal diameter and same version

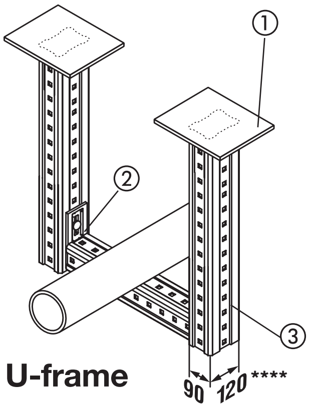
** Value for F_Z with simultaneously acting horizontal load F_X or F_Y

*** Applies to all values for Fz + Fx // Fy, i.e. pipe friction is taken into account (// = or)

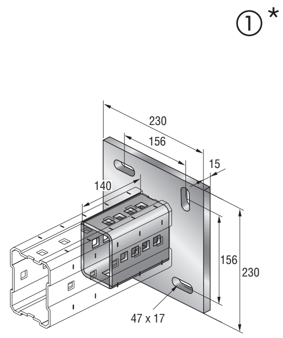
**** In order to achieve the loads listed, the MIC-C90-D must be fastened to the MI-90 girder by way of two bolts in the pipe axis and one bolt in the crossbeam axis.
Note: The third bolt (MIA-OH-90 304889) must be ordered additionally (see page 5.38)

MIC-C120-D U-frames on concrete

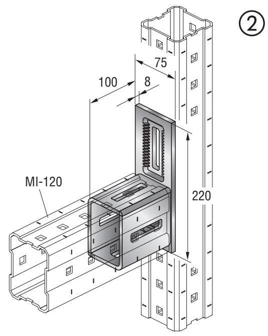
Crossbeam simply supported, columns restrained



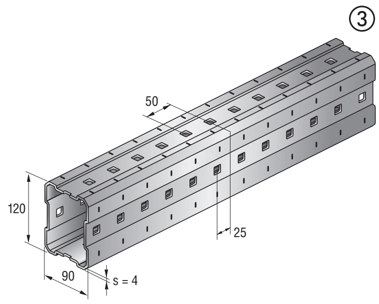
U-frame



MIC-C120-D

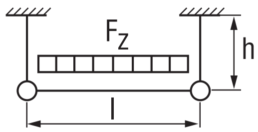


MIC-120-U



MI-120

**** All tablevalues only for showed applications.

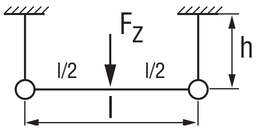


Uniformly distributed load

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	30.65	30.62	30.59	30.56	26.79	23.75	21.31	18.56	15.50
500	Fz + (Fx // Fy)**	17.55	17.52	17.48	17.45	17.42	17.39	17.36	16.49	15.07
1000	Fz + (Fx // Fy)**	9.57	9.57	9.57	9.57	9.57	9.57	9.57	9.57	9.57
1500	Fz + (Fx // Fy)**	6.38	6.38	6.38	6.38	6.38	6.38	6.38	6.38	6.38
2000	Fz + (Fx // Fy)**	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79

*Fx = Fy = Fz × 0.15 ****

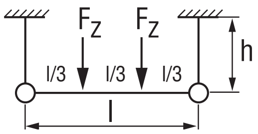


1 single load

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	26.86	21.49	17.90	15.32	13.38	11.86	10.65	9.65	8.82
500	Fz + (Fx // Fy)**	17.55	17.52	15.28	13.08	11.42	10.13	9.09	8.24	7.53
1000	Fz + (Fx // Fy)**	9.57	9.57	9.57	9.57	9.57	9.57	9.09	8.24	7.53
1500	Fz + (Fx // Fy)**	6.38	6.38	6.38	6.38	6.38	6.38	6.38	6.38	6.38
2000	Fz + (Fx // Fy)**	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79

*Fx = Fy = Fz × 0.15 ****

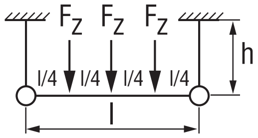


2 single loads

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	15.33	15.31	13.39	11.47	10.02	8.89	7.98	6.81	5.69
500	Fz + (Fx // Fy)**	8.77	8.76	8.74	8.73	8.56	7.59	6.82	6.18	5.65
1000	Fz + (Fx // Fy)**	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79
1500	Fz + (Fx // Fy)**	3.19	3.19	3.19	3.19	3.19	3.19	3.19	3.19	3.19
2000	Fz + (Fx // Fy)**	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39

*Fx = Fy = Fz × 0.15 ****

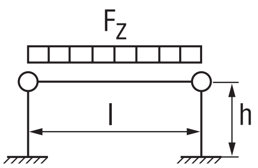


3 single loads

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	10.22	10.21	8.97	7.70	6.74	5.99	5.39	4.90	4.17
500	Fz + (Fx // Fy)**	5.85	5.84	5.83	5.82	5.75	5.11	4.60	4.18	3.83
1000	Fz + (Fx // Fy)**	3.19	3.19	3.19	3.19	3.19	3.19	3.19	3.19	3.19
1500	Fz + (Fx // Fy)**	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13
2000	Fz + (Fx // Fy)**	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60

*Fx = Fy = Fz × 0.15 ****



All structures listed can also be used standing (see illustrations)

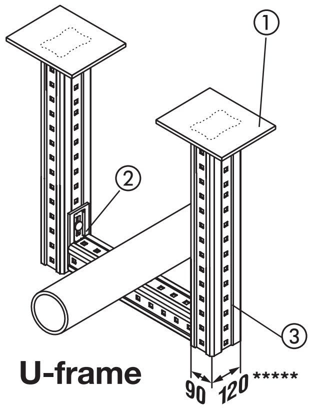
* Fastened to concrete by way of approved Hilti anchors of the type HST (R) M12; alternative approved Hilti anchors are the HDA, HVZ and HIT-TZ of the same nominal diameter and same version

** Value for F_Z with simultaneously acting horizontal load F_X or F_y

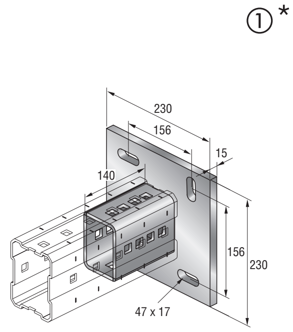
*** Applies to all values for Fz + Fx // Fy, i.e. pipe friction is taken into account (// = or)

MIC-C120-D U-frames on concrete (3 bolts****)

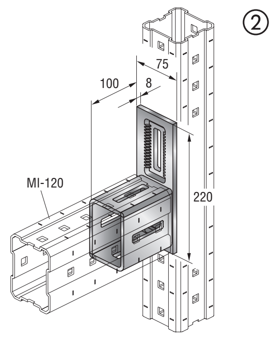
Crossbeam simply supported, columns restrained



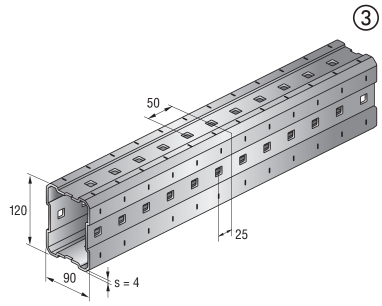
U-frame



MIC-C120-D

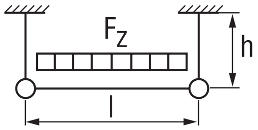


MIC-120-U



MI-120

***** All tablevalues only for showed applications.

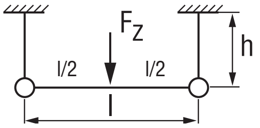


Uniformly distributed load

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	30.65	30.62	30.59	30.56	26.79	23.75	21.31	18.56	15.50
500	Fz + (Fx // Fy)**	17.55	17.52	17.48	17.45	17.42	17.39	17.36	16.49	15.07
1000	Fz + (Fx // Fy)**	15.71	15.71	15.71	15.71	15.71	15.71	15.71	15.71	15.07
1500	Fz + (Fx // Fy)**	10.48	10.48	10.48	10.48	10.48	10.48	10.48	10.48	10.48
2000	Fz + (Fx // Fy)**	7.86	7.86	7.86	7.86	7.86	7.86	7.86	7.86	7.86

*Fx = Fy = Fz × 0.15 ****

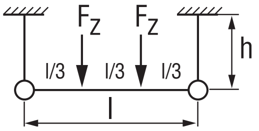


1 single load

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	26.86	21.49	17.90	15.32	13.38	11.86	10.65	9.65	8.82
500	Fz + (Fx // Fy)**	17.55	17.52	15.28	13.08	11.42	10.13	9.09	8.24	7.53
1000	Fz + (Fx // Fy)**	15.71	15.71	15.28	13.08	11.42	10.13	9.09	8.24	7.53
1500	Fz + (Fx // Fy)**	10.48	10.48	10.48	10.48	10.48	10.13	9.09	8.24	7.53
2000	Fz + (Fx // Fy)**	7.86	7.86	7.86	7.86	7.86	7.86	7.86	7.86	7.53

*Fx = Fy = Fz × 0.15 ****

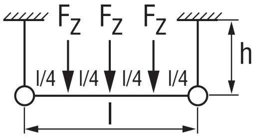


2 single loads

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	15.33	15.31	13.39	11.47	10.02	8.89	7.98	6.81	5.69
500	Fz + (Fx // Fy)**	8.77	8.76	8.74	8.73	8.56	7.59	6.82	6.18	5.65
1000	Fz + (Fx // Fy)**	7.86	7.86	7.86	7.86	7.86	7.59	6.82	6.18	5.65
1500	Fz + (Fx // Fy)**	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24
2000	Fz + (Fx // Fy)**	3.93	3.93	3.93	3.93	3.93	3.93	3.93	3.93	3.93

*Fx = Fy = Fz × 0.15 ****

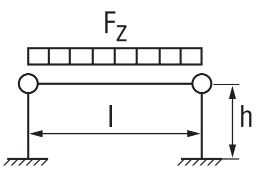


3 single loads

Recommended working load Fz [kN] for girder length l [mm]

Height h [mm]	U-frame width l [mm]	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Fz	10.22	10.21	8.97	7.70	6.74	5.99	5.39	4.90	4.17
500	Fz + (Fx // Fy)**	5.85	5.84	5.83	5.82	5.75	5.11	4.60	4.18	3.83
1000	Fz + (Fx // Fy)**	5.24	5.24	5.24	5.24	5.24	5.11	4.60	4.18	3.83
1500	Fz + (Fx // Fy)**	3.49	3.49	3.49	3.49	3.49	3.49	3.49	3.49	3.49
2000	Fz + (Fx // Fy)**	2.62	2.62	2.62	2.62	2.62	2.62	2.62	2.62	2.62

*Fx = Fy = Fz × 0.15 ****



All structures listed can also be used standing (see illustrations)

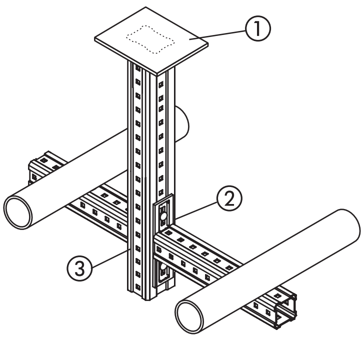
* Fastened to concrete by way of approved Hilti anchors of the type HST (R) M12; alternative approved Hilti anchors are the HDA, HVZ and HIT-TZ of the same nominal diameter and same version

** Value for F_Z with simultaneously acting horizontal load F_X or F_Y

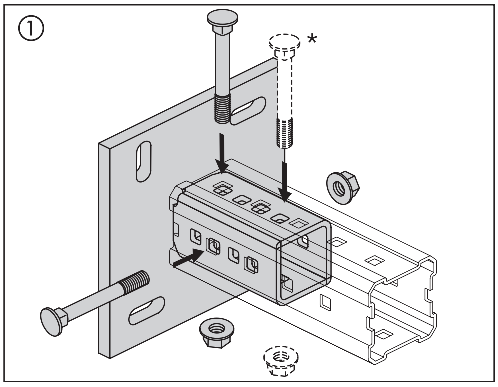
*** Applies to all values for Fz + Fx // Fy, i.e. pipe friction is taken into account (// = or)

**** In order to achieve the loads listed, the MIC-C120-D must be fastened to the MI-120 girder by way of two bolts in the pipe axis and one bolt in the crossbeam axis.
Note: The third bolt (MIA-OH-120 304890) must be ordered additionally (see page 5.38)

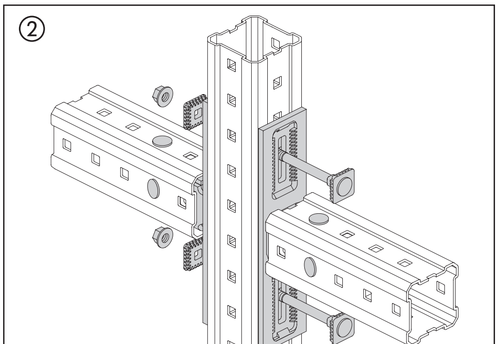
Lorraine cross: General points



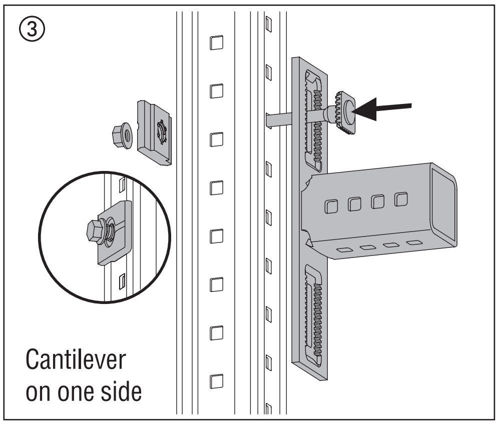
Connections to concrete: MIC-C90/120-D



MI connector: MIC-90-L/MIA-TP/MIC-90-L

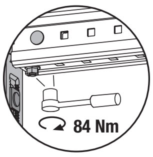


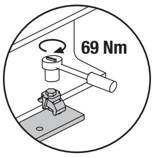
Cantilever on both sides



Cantilever on one side

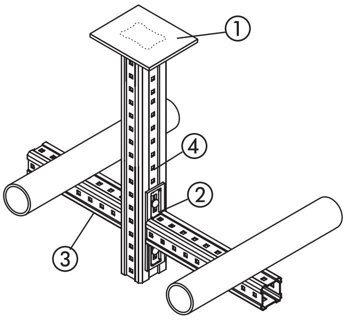
The MI connectors must always make full contact with the MI girder. The bolts should be fitted as close as possible to the fastening plate. (Also see instructions on page 5.8.)
* In some cases, a higher load value can be achieved through use of a third bolt (see load tables). The bolt should be fitted in the direction of the horizontal force.
Note! The third bolt must be ordered additionally.



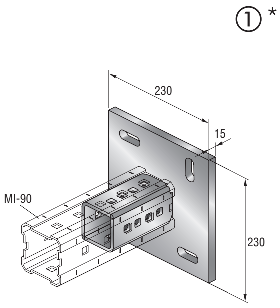


Bolt tightening torque: For connectors For beam clamps

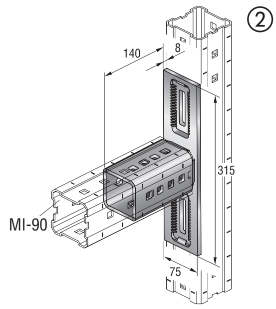
MIC-C90-D Lorraine cross on concrete



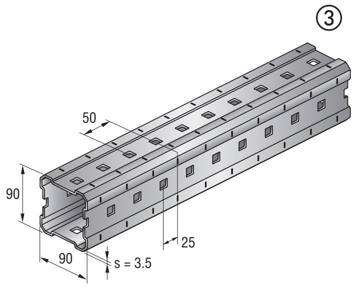
Lorraine cross



MIC-C90-D

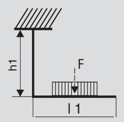
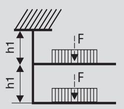
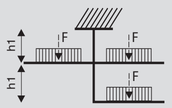
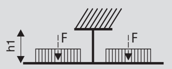
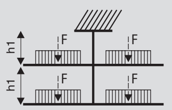


MIC-90-L



MI-90

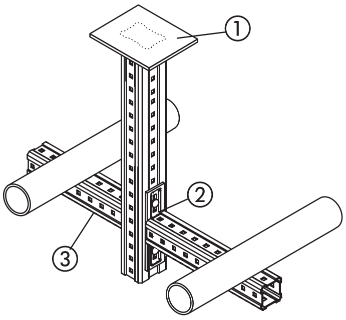
Vertical MI-90 girder (recommended working load F_Z [kN])

Configuration	Cantilever dimensions [mm] l1 \ h1	Loading condition 1 uniform loading ($F_z = q \cdot l$) Fz [kN] 500	750	Loading condition 2 single load (½ Fz ½) Fz [kN] 500	750	Loading condition 3 Fz [kN] 500	750	Loading condition 4 (⅓ Fz ⅓ Fz ⅓) Fz [kN] 500	750	Loading condition 5 (¼ Fz ¼ Fz ¼ Fz ¼) Fz [kN] 500	750
	300	3.650	3.650	3.650	3.650	2.060	2.060	1.820	1.820	1.210	1.210
	500	2.380	2.380	2.380	2.380	1.290	1.290	1.190	1.190	0.790	0.790
	Fx = Fz × 0.15** 300	3.630	3.630	3.630	3.630	1.950	1.950	1.810	1.810	1.210	1.210
	500	2.300	2.300	2.300	2.300	1.150	1.150	1.150	1.150	0.760	0.760
	300	1.820	1.820	1.820	1.820	1.030	1.030	0.910	0.910	0.600	0.600
	500	1.190	1.190	1.190	1.190	0.640	0.640	0.590	0.590	0.390	0.390
	Fx = Fz × 0.15** 300	1.810	1.810	1.810	1.810	1.020	1.020	0.900	0.900	0.600	0.600
	500	1.180	1.180	1.180	1.180	0.640	0.640	0.590	0.590	0.390	0.390
	300	2.420	2.400	2.420	2.400	2.060	2.060	1.210	1.200	0.800	0.800
	500	2.380	2.380	2.380	2.380	1.290	1.290	1.190	1.190	0.790	0.790
	Fx = Fz × 0.15** 300	2.380	1.580	2.380	1.580	1.950	1.580	1.190	0.790	0.790	0.520
	500	2.300	1.580	2.300	1.580	1.150	1.150	1.150	0.790	0.760	0.520
	300	4.750	4.750	4.750	4.750	2.370	2.370	2.370	2.370	1.580	1.580
	500	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	0.940	0.940
	Fx = Fz × 0.15** 300	3.890	3.170	3.890	3.170	1.950	1.950	1.940	1.580	1.290	1.050
	500	2.300	2.300	2.300	2.300	1.150	1.150	1.150	1.150	0.760	0.760
	300	4.750	4.750	4.750	4.750	2.370	2.370	2.370	2.370	1.580	1.580
	500	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	0.940	0.940
	Fx = Fz × 0.15** 300	1.580	1.050	1.580	1.050	1.580	1.050	0.790	0.520	0.520	0.350
	500	1.580	1.050	1.580	1.050	1.150	1.050	0.790	0.520	0.520	0.350

* Fastened to concrete by way of approved Hilti anchors of the type HST (R) M16; alternative approved Hilti anchors are the HDA, HVZ and HIT-TZ of the same nominal diameter and same version.

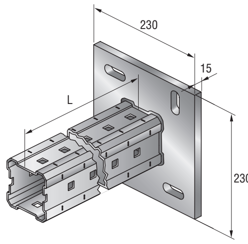
** Value for F_Z with simultaneously acting horizontal load F_X, i.e. pipe friction is taken into account.

MIC-C90-D welded bracket – Lorraine cross on concrete

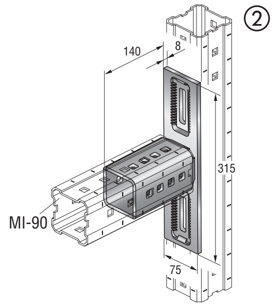


Lorraine cross

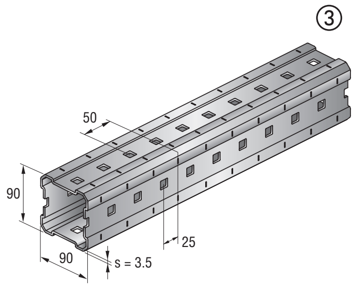
①*



MIC-C90-D-[L]

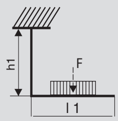
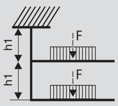
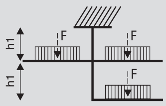
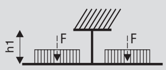
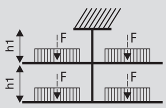


MIC-90-L



MI-90

Vertical MI-90 girder (recommended working load F_Z [kN])

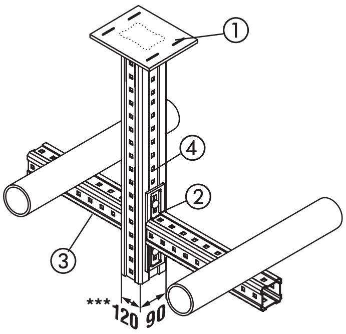
Configuration	Cantilever dimensions [mm]	Loading condition 1 uniform loading ($F_Z = q \cdot l$) Fz [kN]			Loading condition 2 single load (½ Fz ½) Fz [kN]			Loading condition 3 Fz [kN]			Loading condition 4 (⅓ Fz ⅓ Fz ⅓) Fz [kN]			Loading condition 5 (¼ Fz ¼ Fz ¼ Fz ¼) Fz [kN]		
	l1 \ h1	500	750	1000	500	750	1000	500	750	1000	500	750	1000	500	750	1000
	300	4.750	4.750	4.750	4.750	4.750	4.750	2.370	2.370	2.370	2.370	2.370	2.370	1.580	1.580	1.580
	500	2.820	2.820	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	1.410	1.410	0.940	0.940	0.940
	Fx = Fz × 0.15**															
	300	3.900	3.900	3.900	3.900	3.900	3.900	1.950	1.950	1.950	1.950	1.950	1.950	1.300	1.300	1.300
	500	2.300	2.300	2.300	2.300	2.300	2.300	1.150	1.150	1.150	1.150	1.150	1.150	0.760	0.760	0.760
	300	3.360	3.360	3.360	3.360	3.360	3.360	1.900	1.900	1.900	1.680	1.680	1.680	1.120	1.120	1.120
	500	2.210	2.210	2.210	2.210	2.210	2.210	1.190	1.190	1.190	1.100	1.100	1.100	0.730	0.730	0.730
	Fx = Fz × 0.15**															
	300	2.180	2.180	1.900	2.180	2.180	1.900	1.230	1.230	1.230	1.090	1.090	0.950	0.720	0.720	0.630
	500	1.420	1.420	1.420	1.420	1.420	1.420	0.770	0.770	0.770	0.710	0.710	0.710	0.470	0.470	0.470
	300	2.850	2.830	2.810	2.850	2.830	2.810	2.370	2.370	2.370	1.420	1.410	1.400	0.950	0.940	0.930
	500	2.820	2.810	2.790	2.820	2.810	2.790	1.410	1.410	1.410	1.410	1.400	1.390	0.940	0.930	0.930
	Fx = Fz × 0.15**															
	300	2.850	1.900	1.420	2.850	1.900	1.420	1.950	1.900	1.420	1.420	0.950	0.710	0.950	0.630	0.470
	500	2.300	1.900	1.420	2.300	1.900	1.420	1.150	1.150	1.150	1.150	0.950	0.710	0.760	0.630	0.470
	300	4.750	4.750	4.750	4.750	4.750	4.750	2.370	2.370	2.370	2.370	2.370	2.370	1.580	1.580	1.580
	500	2.820	2.820	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	1.410	1.410	0.940	0.940	0.940
	Fx = Fz × 0.15**															
	300	3.900	3.800	2.850	3.900	3.800	2.850	1.950	1.950	1.950	1.950	1.900	1.420	1.300	1.260	0.950
	500	2.300	2.300	2.300	2.300	2.300	2.300	1.150	1.150	1.150	1.150	1.150	1.150	0.760	0.760	0.760
	300	4.750	4.750	4.750	4.750	4.750	4.750	2.370	2.370	2.370	2.370	2.370	2.370	1.580	1.580	1.580
	500	2.820	2.820	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	1.410	1.410	0.940	0.940	0.940
	Fx = Fz × 0.15**															
	300	1.900	1.260	0.950	1.900	1.260	0.950	1.900	1.260	0.950	0.950	0.630	0.470	0.630	0.420	0.310
	500	1.900	1.260	0.950	1.900	1.260	0.950	1.150	1.150	0.950	0.950	0.630	0.470	0.630	0.420	0.310

* Fastened to concrete by way of approved Hilti anchors of the type HST (R) M16; alternative approved Hilti anchors are the HDA, HVZ and HIT-TZ of the same nominal diameter and same version.

** Value for F_Z with simultaneously acting horizontal load F_X, i.e. pipe friction is taken into account.

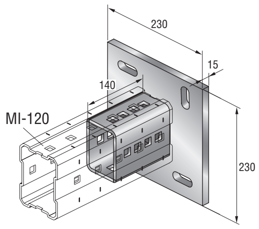
[L] Length of bracket: 500 mm, 750 mm or 1000 mm

MIC-C120-D Lorraine cross on concrete

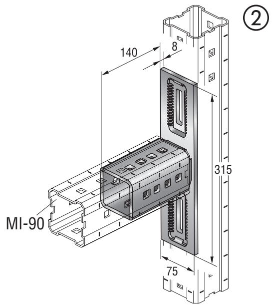


Lorraine cross

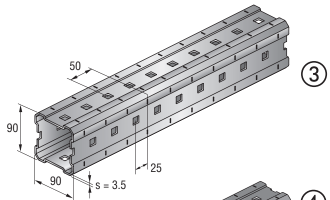
① *



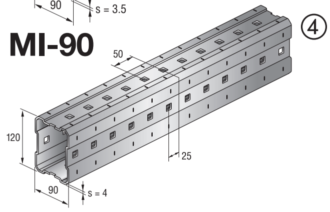
MIC-C120-D



MIC-90-L



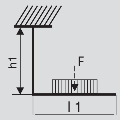
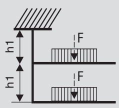
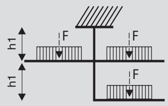
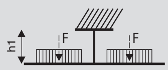
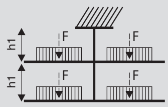
MI-90



MI-120

*** All tablevalues only for showed applications.

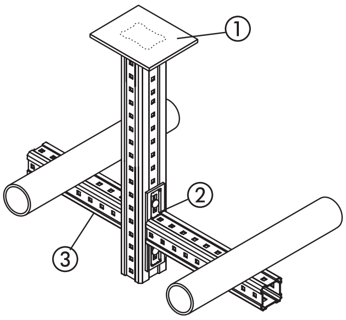
Vertical MI-120 girder (recommended working load F_Z [kN])

Configuration	Cantilever dimensions [mm] l1 \ h1	Loading condition 1 uniform loading ($F_Z = q \cdot l$) Fz [kN] 500	750	Loading condition 2 single loadt (½ Fz ½) Fz [kN] 500	750	Loading condition 3 Fz [kN] 500	750	Loading condition 4 (Fz Fz, ⅓ ⅓ ⅓) Fz [kN] 500	750	Loading condition 5 (Fz Fz Fz, ¼ ¼ ¼ ¼) Fz [kN] 500	750
	300	4.590	4.560	4.590	4.560	2.370	2.370	2.290	2.280	1.530	1.520
	500	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	0.940	0.940
	Fx=Fz×0.15**										
	300	3.900	3.900	3.900	3.900	1.950	1.950	1.950	1.950	1.300	1.300
	500	2.300	2.300	2.300	2.300	1.150	1.150	1.150	1.150	0.760	0.760
	300	2.250	2.220	2.250	2.220	1.370	1.370	1.120	1.110	0.750	0.740
	500	1.580	1.580	1.580	1.580	0.870	0.870	0.790	0.790	0.520	0.520
	Fx=Fz×0.15**										
	300	2.350	2.120	2.350	2.120	1.370	1.370	1.170	1.060	0.780	0.700
	500	1.580	1.580	1.580	1.580	0.870	0.870	0.790	0.790	0.520	0.520
	300	3.090	3.070	3.090	3.070	2.370	2.370	1.540	1.530	1.030	1.020
	500	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	0.940	0.940
	Fx=Fz×0.15**										
	300	2.390	1.590	2.390	1.590	1.950	1.590	1.190	0.790	0.790	0.530
	500	2.300	1.590	2.300	1.590	1.150	1.150	1.150	0.790	0.760	0.530
	300	4.750	4.750	4.750	4.750	2.370	2.370	2.370	2.370	1.580	1.580
	500	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	0.940	0.940
	Fx=Fz×0.15**										
	300	3.900	3.190	3.900	3.190	1.950	1.950	1.950	1.590	1.300	1.060
	500	2.300	2.300	2.300	2.300	1.150	1.150	1.150	1.150	0.760	0.760
	300	4.750	4.750	4.750	4.750	2.370	2.370	2.370	2.370	1.580	1.580
	500	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.140	0.940	0.940
	Fx=Fz×0.15**										
	300	1.590	1.060	1.590	1.060	1.590	1.060	0.790	0.530	0.530	0.350
	500	1.590	1.060	1.590	1.060	1.150	1.060	0.790	0.530	0.530	0.350

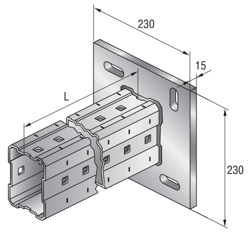
* Fastened to concrete by way of approved Hilti anchors of the type HST (R) M16; alternative approved Hilti anchors are the HDA, HVZ and HIT-TZ of the same nominal diameter and same version.

** Value for F_Z with simultaneously acting horizontal load F_X, i.e. pipe friction is taken into account.

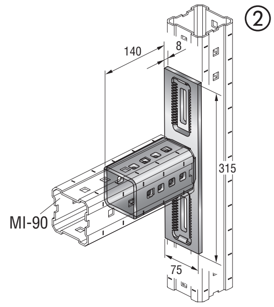
MIC-C120-D welded bracket – Lorraine cross on concrete



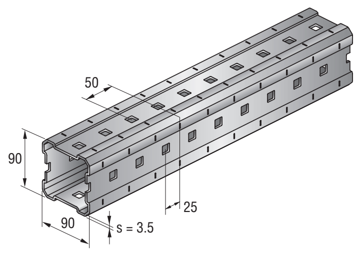
Lorraine cross



MIC-C120-D-[L]

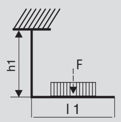
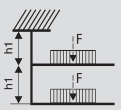
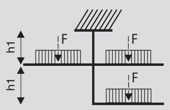
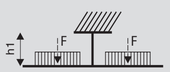
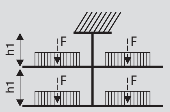


MIC-90-L



MI-90

Vertical MI-120 girder (recommended working load F_Z [kN])

Configuration	Cantilever dimensions [mm]	Loading condition 1 uniform loading ($F_Z = q \cdot l$) Fz [kN]			Loading condition 2 single load (1/2 Fz 1/2) Fz [kN]			Loading condition 3 Fz [kN]			Loading condition 4 (Fz Fz at 1/3 1/3 1/3) Fz [kN]			Loading condition 5 (Fz Fz Fz at 1/4 1/4 1/4 1/4) Fz [kN]		
	l1 \ h1	500	750	1000	500	750	1000	500	750	1000	500	750	1000	500	750	1000
	300	4.750	4.750	4.750	4.750	4.750	4.750	2.370	2.370	2.370	2.370	2.370	2.370	1.580	1.580	1.580
	500	2.820	2.820	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	1.410	1.410	0.940	0.940	0.940
	Fx = Fz×0.15** 300	3.900	3.900	3.900	3.900	3.900	3.900	1.950	1.950	1.950	1.950	1.950	1.950	1.300	1.300	1.300
	500	2.300	2.300	2.300	2.300	2.300	2.300	1.150	1.150	1.150	1.150	1.150	1.150	0.760	0.760	0.760
	300	2.890	2.860	2.830	2.890	2.860	2.830	2.370	2.370	2.370	1.440	1.430	1.410	0.960	0.950	0.940
	500	2.820	2.820	2.810	2.820	2.820	2.810	1.410	1.410	1.410	1.410	1.410	1.400	0.940	0.940	0.930
	Fx = Fz×0.15** 300	2.530	2.530	2.380	2.530	2.530	2.380	1.470	1.470	1.470	1.260	1.260	1.190	0.840	0.840	0.790
	500	1.700	1.700	1.700	1.700	1.700	1.700	0.940	0.940	0.940	0.850	0.850	0.850	0.560	0.560	0.560
	300	4.320	4.300	4.280	4.320	4.300	4.280	2.370	2.370	2.370	2.160	2.150	2.140	1.440	1.430	1.420
	500	2.820	2.820	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	1.410	1.410	0.940	0.940	0.940
	Fx = Fz×0.15** 300	3.490	2.380	1.780	3.490	2.380	1.780	1.950	1.950	1.780	1.740	1.190	0.890	1.160	0.790	0.590
	500	2.300	2.300	1.780	2.300	2.300	1.780	1.150	1.150	1.150	1.150	1.150	0.890	0.760	0.760	0.590
	300	4.750	4.750	4.750	4.750	4.750	4.750	2.370	2.370	2.370	2.370	2.370	2.370	1.580	1.580	1.580
	500	2.820	2.820	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	1.410	1.410	0.940	0.940	0.940
	Fx = Fz×0.15** 300	3.900	3.900	3.570	3.900	3.900	3.570	1.950	1.950	1.950	1.950	1.950	1.780	1.300	1.300	1.190
	500	2.300	2.300	2.300	2.300	2.300	2.300	1.150	1.150	1.150	1.150	1.150	1.150	0.760	0.760	0.760
	300	4.750	4.750	4.750	4.750	4.750	4.750	2.370	2.370	2.370	2.370	2.370	2.370	1.580	1.580	1.580
	500	2.820	2.820	2.820	2.820	2.820	2.820	1.410	1.410	1.410	1.410	1.410	1.410	0.940	0.940	0.940
	Fx = Fz×0.15** 300	2.380	1.580	1.190	2.380	1.580	1.190	1.950	1.580	1.190	1.190	0.790	0.590	0.790	0.520	0.390
	500	2.300	1.580	1.190	2.300	1.580	1.190	1.150	1.150	1.150	1.150	0.790	0.590	0.760	0.520	0.390

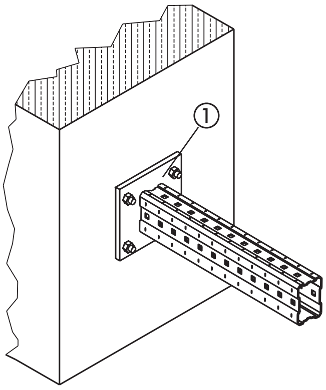
* Fastened to concrete by way of approved Hilti anchors of the type HST (R) M16; alternative approved Hilti anchors are the HDA, HVZ and HIT-TZ of the same nominal diameter and same version.

** Value for F_Z with simultaneously acting horizontal load F_X, i.e. pipe friction is taken into account.

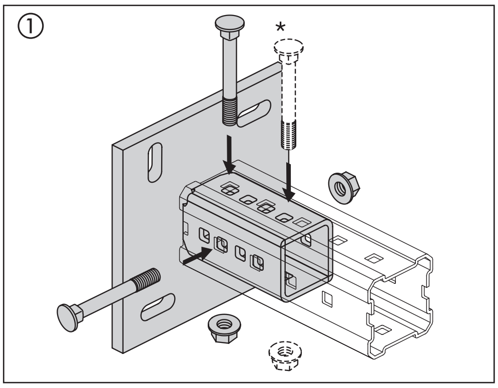
[L] Length of bracket: 500 mm, 750 mm or 1000 mm

Cantilever: General points

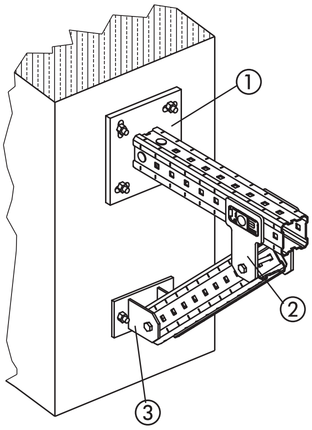
Concrete



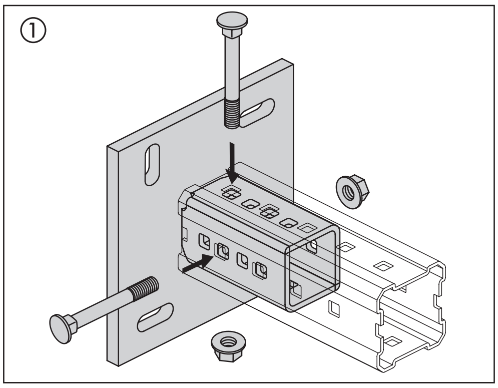
MIC-C90-D / MIC-C120-D



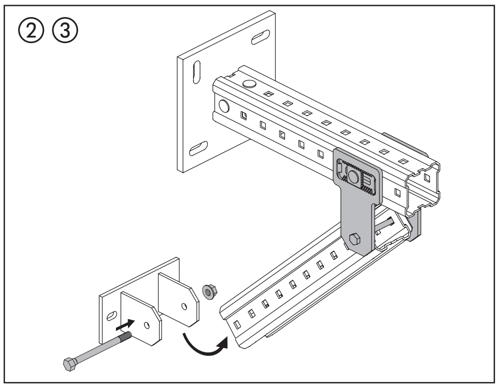
Concrete



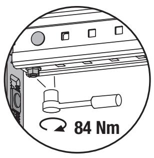
MIC-C90-D / MIC-C120-D

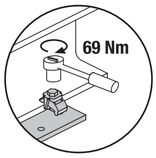


MIC-T, MIC-CU-MA



The MI connectors must always make full contact with the MI girder.
The bolts should be fitted as close as possible to the fastening plate. (Also see instructions on page 5.8.)

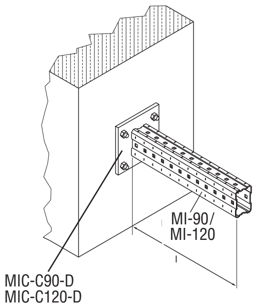


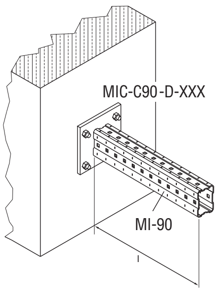


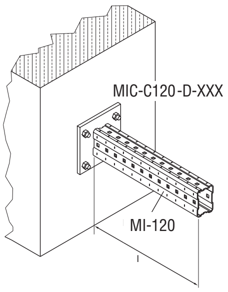
Bolt tightening torque: For connectors For beam clamps

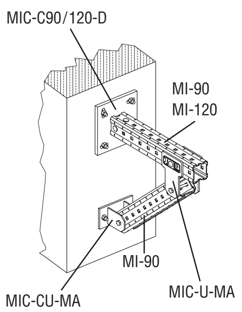
Cantilever MI-90 / 120

Recommended working load F_Z [kN]









Connection by way of	Cantilever length l [mm]	Loading condition 1 uniform loading ($F_Z = q \cdot l$) Fz [kN]	Loading condition 2 single load Fz [kN]	Loading condition 3 Fz [kN]	Loading condition 4 Fz [kN]	Loading condition 5 Fz [kN]
MIC-C90-D	500	2.820 (3.720)	2.820 (3.720)	1.410 (1.860)	1.410 (1.860)	0.940 (1.240)
MIC-C90-D	1000	1.340 (1.790)	1.340 (1.790)	0.670 (0.890)	0.670 (0.890)	0.440 (0.590)
Fx = Fz × 0.15**						
MIC-C90-D	500	2.820 (3.720)	2.820 (3.720)	1.410 (1.860)	1.410 (1.860)	0.940 (1.240)
MIC-C90-D	1000	1.340 (1.790)	1.340 (1.790)	0.670 (0.890)	0.670 (0.890)	0.440 (0.590)
MIC-C120-D	500	3.920 (5.430)	3.920 (5.430)	1.960 (2.710)	1.960 (2.710)	1.300 (1.810)
MIC-C120-D	1000	1.860 (2.640)	1.860 (2.640)	0.930 (1.320)	0.930 (1.320)	0.620 (0.880)
Fx = Fz × 0.15**						
MIC-C120-D	500	3.920 (5.430)	3.920 (5.430)	1.960 (2.710)	1.960 (2.710)	1.300 (1.810)
MIC-C120-D	1000	1.860 (2.640)	1.860 (2.640)	0.930 (1.320)	0.930 (1.320)	0.620 (0.880)
MIC-C90-D-500	500	9.380	9.380	4.690	4.690	3.120
MIC-C90-D-750	750	6.210	6.210	3.100	3.100	2.070
MIC-C90-D-1000	1000	4.610	4.610	2.300	2.300	1.530
Fx = Fz × 0.15*						
MIC-C90-D-500	500	7.230	7.230	3.610	3.610	2.410
MIC-C90-D-750	750	4.780	4.780	2.390	2.390	1.590
MIC-C90-D-1000	1000	3.540	3.540	1.770	1.770	1.180
MIC-C120-D-500	500	10.000	10.000	5.320	5.320	3.550
MIC-C120-D-750	750	7.040	7.040	3.520	3.520	2.340
MIC-C120-D-1000	1000	5.230	5.230	2.610	2.610	1.740
Fx = Fz × 0.15*						
MIC-C120-D-500	500	8.500	8.500	4.250	4.250	2.830
MIC-C120-D-750	750	5.610	5.610	2.800	2.800	1.870
MIC-C120-D-1000	1000	4.150	4.150	2.070	2.070	1.380
MIC-C90/120-D, MIC-U-MA, MIC-CU-MA*	500	11.970	11.970	5.980	5.980	3.990
MIC-C90/120-D, MIC-U-MA, MIC-CU-MA*	1000	13.340	13.340	6.670	6.670	4.440
Fx = Fz × 0.15**						
MIC-C90/120-D, MIC-U-MA, MIC-CU-MA*	500	11.970	11.970	5.980	5.980	3.990
MIC-C90/120-D, MIC-U-MA, MIC-CU-MA*	1000	9.570	9.570	4.780	4.780	3.190

The load values apply to concrete of at least the C20/25 grade. The cantilever's own weight is taken into account. The load values apply only to fastenings made well away from edges (special calculations are required for fastenings made at edges). The recommended minimum distance from edges must be observed.

Separate verification must be provided for loads taken up by the base material (steel, concrete).
The anchor approval application guidelines must be observed. Load values are according to approval status May 2004.
Deformation of l/150 is adhered to in all cases, measured at the outermost point of load action.

Concrete: four approved Hilti HST(R) M16 anchors; alternative approved Hilti anchors are the Hilt HVZ, HIT-TZ(R) of the same nominal diameter and same version.

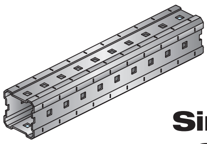
*Concrete: (above) four approved Hilti HST(R) M16 anchors, (below) two approved Hilti HST(R) M12 anchors; alternative approved Hilti anchors are the Hilt HVZ, HIT-TZ(R) of the same nominal diameter and same version.

MI System individual parts

All load values given for the parts below are recommended loads.
Loads taken up by the base material must be verified separately.
The design value = recommended load × factor 1.5; except MI girder factor 1.4

MI girder

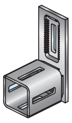
MI-90 / MI-120



Values for each cross section
Recommended buckling loads
Single span with bending load in single axis
Single span with bending load in two axes
5.55 - 5.66

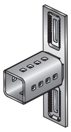
Connectors

Crossbeam connectors for MI girders



MIC-90-U
MIC-120-U
5.67

Cantilever connector for MI girders



MIC-90-L
5.68

Pedestal connector for MI girder to MI girder

MIC-T
5.69

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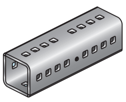
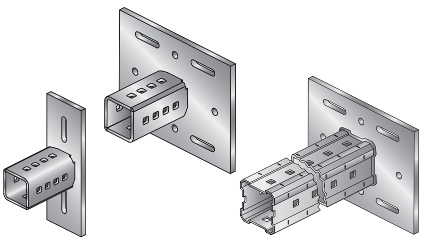
girder extension



MIC-90-E
MIC-120-E
5.70

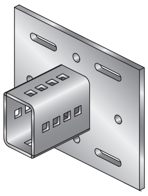
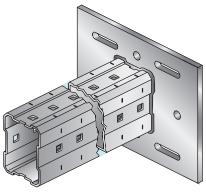
Cantilever connector for steel beams



MIC-S90-AA
MIC-S90-A
MIC-S90-B
MIC-S90-C
MIC-S90-A welded bracket
MIC-S90-B welded bracket
MIC-S90-C welded bracket
5.71 - 5.74

MI System individual parts

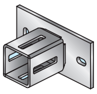
Cantilever connector for steel beams

MIC-S120-A
MIC-S120-B
MIC-S120-C
MIC-S120-A welded bracket
MIC-S120-B welded bracket
MIC-S120-C welded bracket

5.75 - 5.78

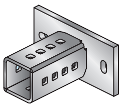
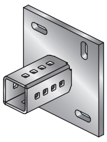
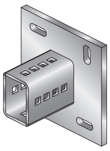
Angle connector for MI girders



MIC-C90-U
C90-U

5.79

Cantilever connector for concrete

MIC-C90-AA
MIC-C90-D
MIC-C120-D
MIC-C90-D welded bracket
MIC-C120-D welded bracket

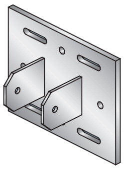
5.79 - 5.81

Angle connector for MI girders

MIC-U-MA

5.82

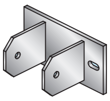
Angle connector for steel beams



MIC-SA-MA
MIC-SB-MA
MIC-SC-MA

5.82

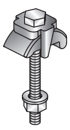
Angle connector for concrete



MIC-CU-MA

5.82

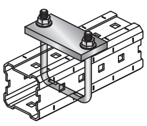
Beam clamp



MI-SGC-M12

5.83

Adaptor plate for weld-on tabs

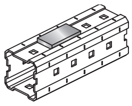


MIC-SPH-90
MIC-SPH-120

5.84

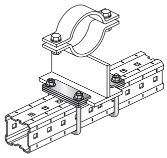
MI System individual parts

Low-friction insert



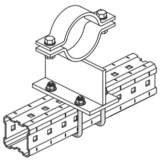
MIC-PG 5.85

Clamps for sliding supports on MI girder



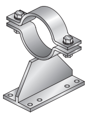
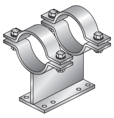
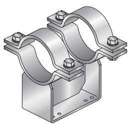
MIC-PS90
MIC-PS120 5.85

Clamps for fixed points on MI girders



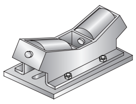
MIA-B090-M12
MIA-B120-M12 5.85

Pipe supports

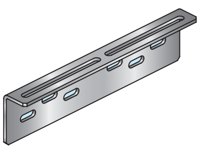
MIC-PS1/1	**DN 25-150**	
MIC-PS2/1	**DN 25-300**	
MIC-PS2/2	**DN 200-600**	5.86

Roller supports



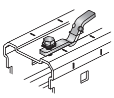
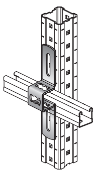
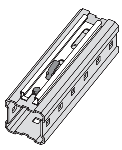
MI-DPR	**DN 200-400**	5.87

Connecting parts for U-bolt clamps on MI girders

MIC-UB90-M12
MIC-UB90-M16
MIC-UB120-M12
MIC-UB120-M16
MIC-UB90 L400 5.88

MQ connectors for MI girders

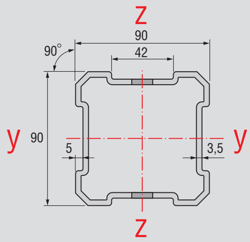
  

MIC-MI / MQ-X
MIC-MI / MQ-M8 5.89

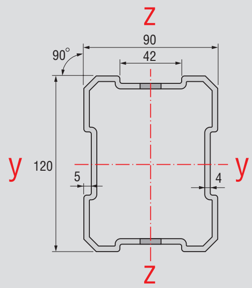
Values for cross sections incl. torsion

Technical data

Cross sections



MI-90

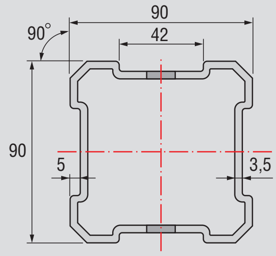


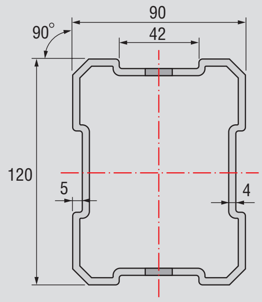
MI-120

Technical data		MI-90	MI-120
Material thickness	S [mm]	3.5	4.0
Cross sectional area	A [mm^2]	1002.6	1375.7
Weight of girder	[kg/m]	9.43	12.60
Lengths available	[m]	3/6	3/6
Material			
Yield strength	$f_{y,k}$ [N/mm^2]	235.0	235.0
Rec. tensile stress	σ_{rec} [N/mm^2]	152.6	152.6
Rec. shear stress	τ_{rec} [N/mm^2]	88.1	88.1
Modulus of elasticity	[N/mm^2]	210000	210000
Shear modulus	[N/mm^2]	81000	81000
Surface			
Hot-dip galvanized		70 µm	70 µm
Cross section values **Y-axis**			
Moment of inertia	I_y [cm^4]	115.34	265.78
Section modulus	W_y [cm^3]	25.63	44.30
Radius of gyration	i_y [cm]	3.39	4.40
Static moment	$S_{y\,max.}$ [cm^3]	16.11	28.12
Permissible moment	[kNm]	3.911	6.760
Z-axis			
Moment of inertia	I_z [cm^4]	115.34	173.58
Section modulus	W_z [cm^3]	25.63	38.57
Radius of gyration	i_z [cm]	3.39	3.55
Static moment	$S_{z\,max}$ [cm^3]	16.11	23.30
Permissible moment	[kNm]	3.911	5.886
Torsion values			
Torsional moment of inertia	ΣI_t [cm^4]	155.56	297.02
Torsional section modulus	$W_t = 2 * A_{Bredt} * t$ [cm^3]	45.25	71.63
Warping moment of inertia	$I_{\omega\omega} = C_M$ [cm^3]	8.19	82.62
Uniform warping	ω_{max} [cm^3]	1.33	3.86
Warping area moment	$S\omega_{max}$ [cm^3]	0.37	2.06

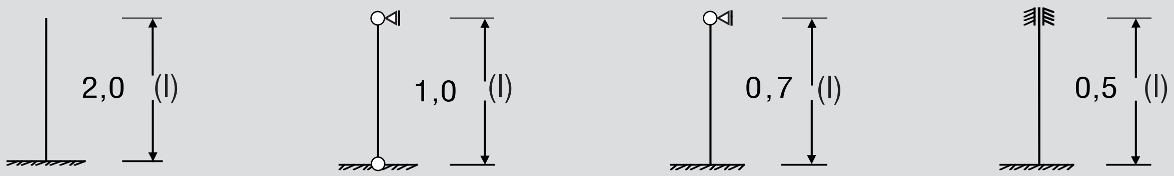
Recommended buckling loads for MI girders

Buckling stress line " a " as per DIN 18800 part 2





buckling loads effective length [cm]	MI-90 [kN]	MI-120 [kN]
25	152.0	208.6
50	152.0	208.6
75	150.8	207.4
100	148.1	203.9
125	145.1	200.1
150	141.8	195.9
175	138.1	191.1
200	133.6	185.7
225	128.4	179.2
250	122.3	171.7
275	115.2	163.0
300	107.3	153.1
325	99.0	142.5
350	90.7	131.6
375	82.8	120.8
400	75.4	110.6
425	68.6	101.1
450	62.6	92.5
475	57.2	84.7
500	52.4	77.7
525	48.1	71.5
550	44.3	65.9
575	40.9	60.9
600	37.8	56.4
625	35.1	52.4
650	32.6	48.8
675	30.4	45.5
700	28.4	42.5
725	26.6	39.8
750	25.0	37.4
775	23.5	35.1
800	22.1	33.1

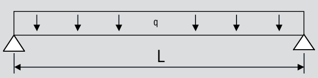


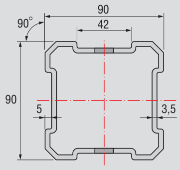
Condition 1 | Condition 2 | Condition 3 | Condition 4

Single-span with bending load in one axis

F_1 at f = L/200, F_2 at f = L/300, F at σ_{per} incl. own weight of girder

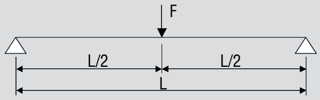
MI-90, uniformly distributed load

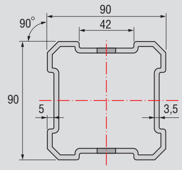




Length of span [cm]	q [kN/m]	F [kN]	f [mm] ≤ σ_{zul}	F1 [kN]	f [mm] ≤ l/200	F2 [kN]	f [mm] ≤ l/300
25	500.33	125.08	0.1	–	–	–	–
50	125.06	62.53	0.4	–	–	–	–
75	55.54	41.65	0.9	–	–	–	–
100	31.20	31.20	1.7	–	–	–	–
125	19.94	24.92	2.6	–	–	–	–
150	13.82	20.73	3.8	–	–	–	–
175	10.13	17.72	5.2	–	–	–	–
200	7.73	15.47	6.7	–	–	15.32	6.7
225	6.09	13.70	8.5	–	–	12.05	7.5
250	4.92	12.29	10.5	–	–	9.70	8.3
275	4.05	11.13	12.7	–	–	7.95	9.2
300	3.39	10.16	15.1	10.07	15.0	6.62	10.0
325	2.87	9.34	17.8	8.51	16.3	5.58	10.8
350	2.46	8.63	20.6	7.28	17.5	4.75	11.7
375	2.14	8.01	23.7	6.28	18.8	4.07	12.5
400	1.9	7.5	26.9	5.45	20.0	3.52	13.3
425	1.6	7.0	30.4	4.77	21.3	3.05	14.2
450	1.5	6.6	34.1	4.19	22.5	2.66	15.0
475	1.3	6.2	38.0	3.70	23.8	2.32	15.8
500	1.2	5.8	42.1	3.27	25.0	2.03	16.7
525	1.0	5.5	46.4	2.90	26.3	1.78	17.5
550	0.9	5.2	50.9	2.58	27.5	1.56	18.3
575	0.9	4.9	55.6	2.30	28.8	1.36	19.2
600	0.8	4.7	60.6	2.05	30.0	1.19	20.0

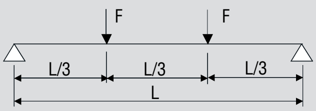
MI-90, one single load

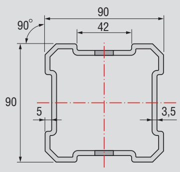




Length of span [cm]	F [kN]	f [mm] ≤ σ_{zul}	F1 [kN]	f [mm] ≤ l/200	F2 [kN]	f [mm] ≤ l/300
25	58.75	< 0.1	–	–	–	–
50	30.75	0.3	–	–	–	–
75	20.67	0.8	–	–	–	–
100	15.54	1.3	–	–	–	–
125	12.43	2.1	–	–	–	–
150	10.34	3.0	–	–	–	–
175	8.85	4.1	–	–	–	–
200	7.72	5.4	–	–	–	–
225	6.85	6.8	–	–	–	–
250	6.14	8.4	–	–	6.06	8.3
275	5.56	10.2	–	–	4.97	9.2
300	5.08	12.2	–	–	4.14	10.0
325	4.67	14.3	–	–	3.49	10.8
350	4.31	16.6	–	–	2.97	11.7
375	4.00	19.1	3.92	18.8	2.55	12.5
400	3.73	21.8	3.41	20.0	2.20	13.3
425	3.5	24.6	2.98	21.3	1.91	14.2
450	3.3	27.6	2.62	22.5	1.66	15.0
475	3.1	30.8	2.31	23.8	1.45	15.8
500	2.9	34.2	2.05	25.0	1.27	16.7
525	2.7	37.8	1.82	26.3	1.11	17.5
550	2.6	41.6	1.61	27.5	0.97	18.3
575	2.5	45.5	1.44	28.8	0.85	19.2
600	2.3	49.7	1.28	30.0	0.74	20.0

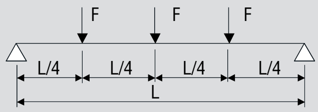
MI-90, two single loads

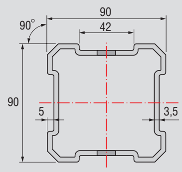




Length of span [cm]	F [kN]	f [mm] ≤ σ_{zul}	F1 [kN]	f [mm] ≤ l/200	F2 [kN]	f [mm] ≤ l/300
25	41.12	< 0.1	–	–	–	–
50	22.61	0.4	–	–	–	–
75	15.36	1.0	–	–	–	–
100	11.59	1.7	–	–	–	–
125	9.29	2.7	–	–	–	–
150	7.74	3.9	–	–	–	–
175	6.63	5.2	–	–	–	–
200	5.79	6.9	–	–	5.62	6.7
225	5.13	8.7	–	–	4.42	7.5
250	4.60	10.7	–	–	3.56	8.3
275	4.17	13.0	–	–	2.92	9.2
300	3.81	15.5	3.69	15.0	2.43	10.0
325	3.50	18.1	3.12	16.3	2.05	10.8
350	3.23	21.0	2.67	17.5	1.74	11.7
375	3.00	24.1	2.30	18.8	1.49	12.5
400	2.8	27.5	2.00	20.0	1.29	13.3
425	2.6	31.0	1.75	21.3	1.12	14.2
450	2.5	34.8	1.54	22.5	0.98	15.0
475	2.3	38.7	1.36	23.8	0.85	15.8
500	2.2	42.9	1.20	25.0	0.75	16.7
525	2.1	47.3	1.07	26.3	0.65	17.5
550	1.9	51.9	0.95	27.5	0.57	18.3
575	1.8	56.7	0.84	28.8	0.50	19.2
600	1.8	61.7	0.75	30.0	0.43	20.0

MI-90, three single loads



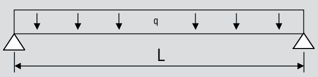


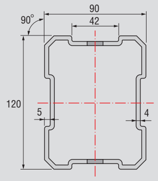
Length of span [cm]	F [kN]	f [mm] ≤ σ_{zul}	F1 [kN]	f [mm] ≤ l/200	F2 [kN]	f [mm] ≤ l/300
25	27.42	< 0.1	–	–	–	–
50	15.08	0.4	–	–	–	–
75	10.26	0.9	–	–	–	–
100	7.75	1.6	–	–	–	–
125	6.22	2.5	–	–	–	–
150	5.19	3.6	–	–	–	–
175	4.45	4.9	–	–	–	–
200	3.90	6.4	–	–	–	–
225	3.47	8.1	–	–	3.22	7.5
250	3.12	10.0	–	–	2.60	8.3
275	2.83	12.0	–	–	2.15	9.2
300	2.60	14.3	–	–	1.81	10.0
325	2.40	16.8	2.24	16.3	1.54	10.8
350	2.23	19.5	1.92	17.5	1.32	11.7
375	2.08	22.4	1.65	18.8	1.15	12.5
400	1.9	25.4	1.44	20.0	1.01	13.3
425	1.8	28.7	1.25	21.3	0.89	14.2
450	1.7	32.2	1.10	22.5	0.80	15.0
475	1.6	35.8	0.97	23.8	0.71	15.8
500	1.6	39.6	0.86	25.0	0.64	16.7
525	1.5	43.7	0.76	26.3	0.58	17.5
550	1.4	47.9	0.68	27.5	0.53	18.3
575	1.3	52.3	0.60	28.8	0.48	19.2
600	1.3	56.9	0.54	30.0	0.44	20.0

Single-span with bending load in one axis

F_1 at f = L/200, F_2 at f = L/300, F at $\sigma_{per.}$ incl. own weight of girder σ

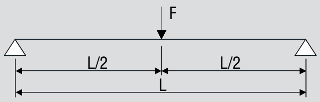
MI-120, uniformly distributed load

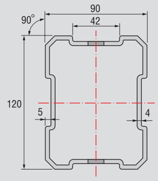




Length of span [cm]	q [kN/m]	F [kN]	f [mm] $\le \sigma_{zul}$	F1 [kN]	f [mm] ≤l/300	F2 [kN]	f [mm] ≤l/300
25	864.73	216.18	< 0.1	–	–	–	–
50	216.18	108.09	0.3	–	–	–	–
75	96.02	72.01	0.7	–	–	–	–
100	53.96	53.96	1.3	–	–	–	–
125	34.49	43.11	2.0	–	–	–	–
150	23.91	35.87	2.8	–	–	–	–
175	17.54	30.69	3.9	–	–	–	–
200	13.40	26.80	5.0	–	–	–	–
225	10.56	23.76	6.4	–	–	–	–
250	8.53	21.33	7.9	–	–	–	–
275	7.03	19.33	9.5	–	–	18.56	9.2
300	5.89	17.66	11.4	–	–	15.52	10.0
325	5.00	16.25	13.3	–	–	13.14	10.8
350	4.29	15.03	15.5	–	–	11.24	11.7
375	3.73	13.97	17.7	–	–	9.71	12.5
400	3.26	13.04	20.2	12.91	20.0	8.45	13.3
425	2.87	12.21	22.8	11.35	21.3	7.40	14.2
450	2.55	11.48	25.5	10.04	22.5	6.51	15.0
475	2.3	10.8	28.5	8.93	23.8	5.76	15.8
500	2.0	10.2	31.5	7.97	25.0	5.11	16.7
525	1.8	9.7	34.8	7.14	26.3	4.55	17.5
550	1.7	9.2	38.2	6.42	27.5	4.06	18.3
575	1.5	8.7	41.7	5.79	28.8	3.63	19.2
600	1.4	8.3	45.4	5.23	30.0	3.25	20.0

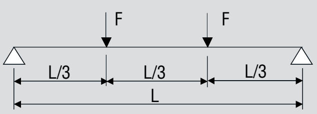
MI-120, one single load

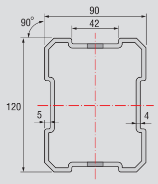




Length of span [cm]	F [kN]	f [mm] $\le \sigma_{zul}$	F1 [kN]	f [mm] ≤l/200	F2 [kN]	f [mm] ≤l/300
25	101.32	< 0.1	–	–	–	–
50	53.13	0.2	–	–	–	–
75	35.73	0.6	–	–	–	–
100	26.86	1.0	–	–	–	–
125	21.50	1.6	–	–	–	–
150	17.90	2.3	–	–	–	–
175	15.32	3.1	–	–	–	–
200	13.38	4.0	–	–	–	–
225	11.87	5.1	–	–	–	–
250	10.66	6.3	–	–	–	–
275	9.66	7.7	–	–	–	–
300	8.83	9.1	–	–	–	–
325	8.12	10.7	–	–	–	–
350	7.51	12.4	–	–	7.03	11.7
375	6.98	14.3	–	–	6.07	12.5
400	6.52	16.3	–	–	5.28	13.3
425	6.10	18.4	–	–	4.62	14.2
450	5.74	20.7	–	–	4.07	15.0
475	5.41	23.1	–	–	3.60	15.8
500	5.11	25.6	4.98	25.0	3.20	16.7
525	4.8	28.2	4.47	26.3	2.85	17.5
550	4.6	31.0	4.01	27.5	2.54	18.3
575	4.5	34.0	3.62	28.8	2.27	19.2
600	4.1	37.1	3.27	30.0	2.03	20.0

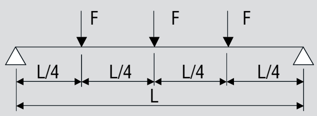
MI-120, two single loads

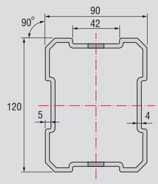




Length of span [cm]	F [kN]	f [mm] $\le \sigma_{zul}$	F1 [kN]	f [mm] ≤l/200	F2 [kN]	f [mm] ≤l/300
25	70.78	< 0.1	–	–	–	–
50	39.04	0.3	–	–	–	–
75	26.55	0.7	–	–	–	–
100	20.04	1.3	–	–	–	–
125	16.07	2.0	–	–	–	–
150	13.39	2.9	–	–	–	–
175	11.47	3.9	–	–	–	–
200	10.02	5.1	–	–	–	–
225	8.89	6.5	–	–	–	–
250	7.99	8.0	–	–	–	–
275	7.24	9.7	–	–	6.81	9.2
300	6.62	11.6	–	–	5.69	10.0
325	6.09	13.6	–	–	4.82	10.8
350	6.63	15.8	–	–	4.12	11.7
375	5.23	18.1	–	–	3.56	12.5
400	4.89	20.6	4.74	20.0	3.10	13.3
425	4.58	23.3	4.17	21.3	2.71	14.2
450	4.30	26.1	3.68	22.5	2.39	15.0
475	4.1	29.1	3.28	23.8	2.11	15.8
500	3.8	32.2	2.92	25.0	1.88	16.7
525	3.6	35.5	2.62	26.3	1.67	17.5
550	3.4	38.9	2.36	27.5	1.49	18.3
575	3.3	42.6	2.12	28.8	1.33	19.2
600	3.1	46.3	1.92	30.0	1.19	20.0

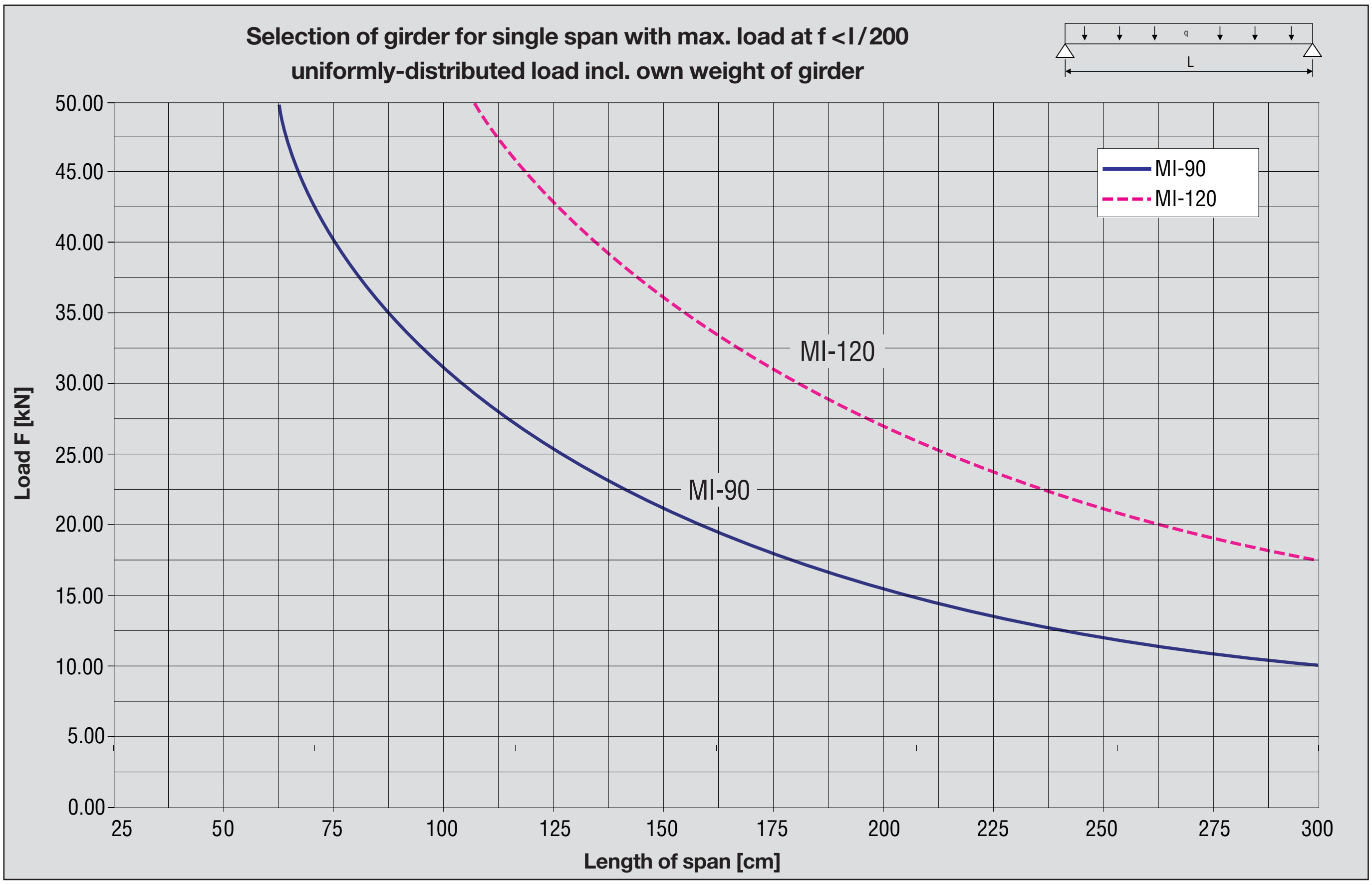
MI-120, three single loads

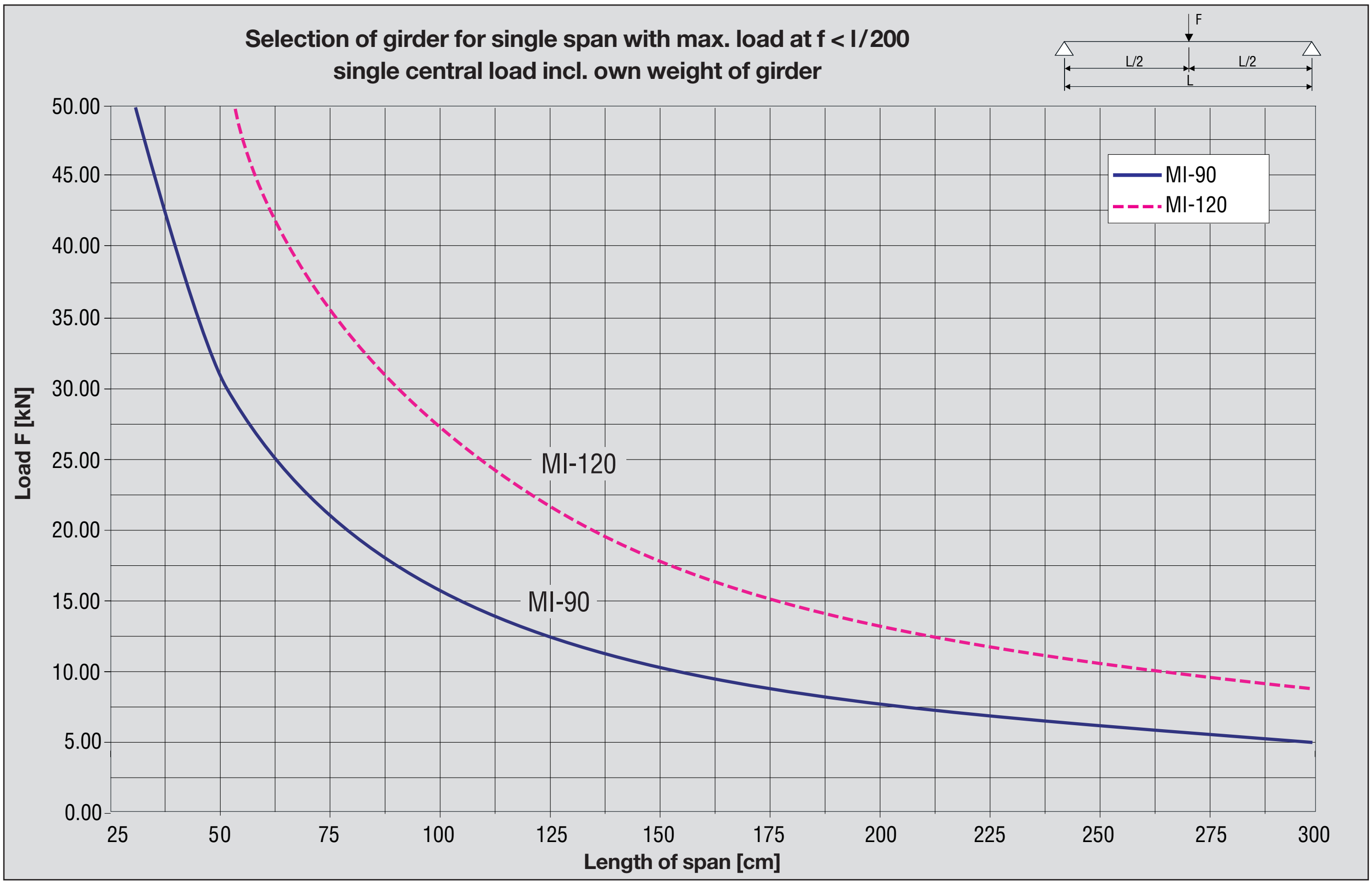




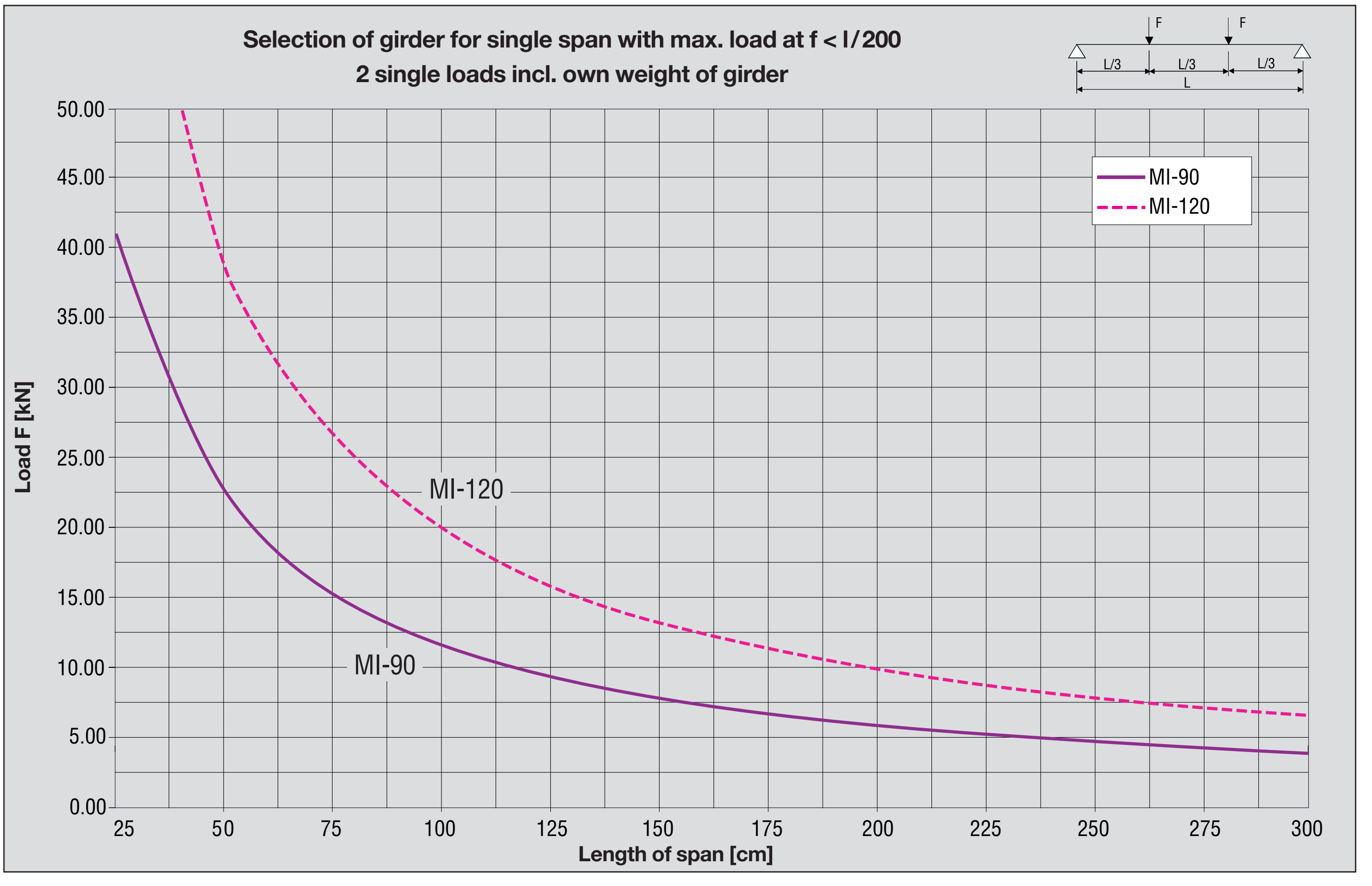
Length of span [cm]	F [kN]	f [mm] $\le \sigma_{zul}$	F1 [kN]	f [mm] ≤l/200	F2 [kN]	f [mm] ≤l/300
25	47.19	< 0.1	–	–	–	–
50	26.04	0.3	–	–	–	–
75	17.72	0.7	–	–	–	–
100	13.39	1.2	–	–	–	–
125	10.74	1.9	–	–	–	–
150	8.97	2.7	–	–	–	–
175	7.70	3.7	–	–	–	–
200	6.74	4.8	–	–	–	–
225	5.99	6.0	–	–	–	–
250	5.39	7.5	–	–	–	–
275	4.90	9.0	–	–	–	–
300	4.49	10.8	–	–	4.17	10.0
325	4.15	12.6	–	–	3.55	10.8
350	3.85	14.6	–	–	3.06	11.7
375	3.59	16.8	–	–	2.66	12.5
400	3.37	19.1	–	–	2.34	13.3
425	3.17	21.5	2.99	21.3	2.07	14.2
450	2.99	24.1	2.64	22.5	1.84	15.0
475	2.83	26.9	2.35	23.8	1.65	15.8
500	2.7	29.8	2.10	25.0	1.49	16.7
525	2.6	32.8	1.88	26.3	1.35	17.5
550	2.4	36.0	1.69	27.5	1.23	18.3
575	2.3	39.3	1.52	28.8	1.12	19.2
600	2.2	42.8	1.38	30.0	1.03	20.0

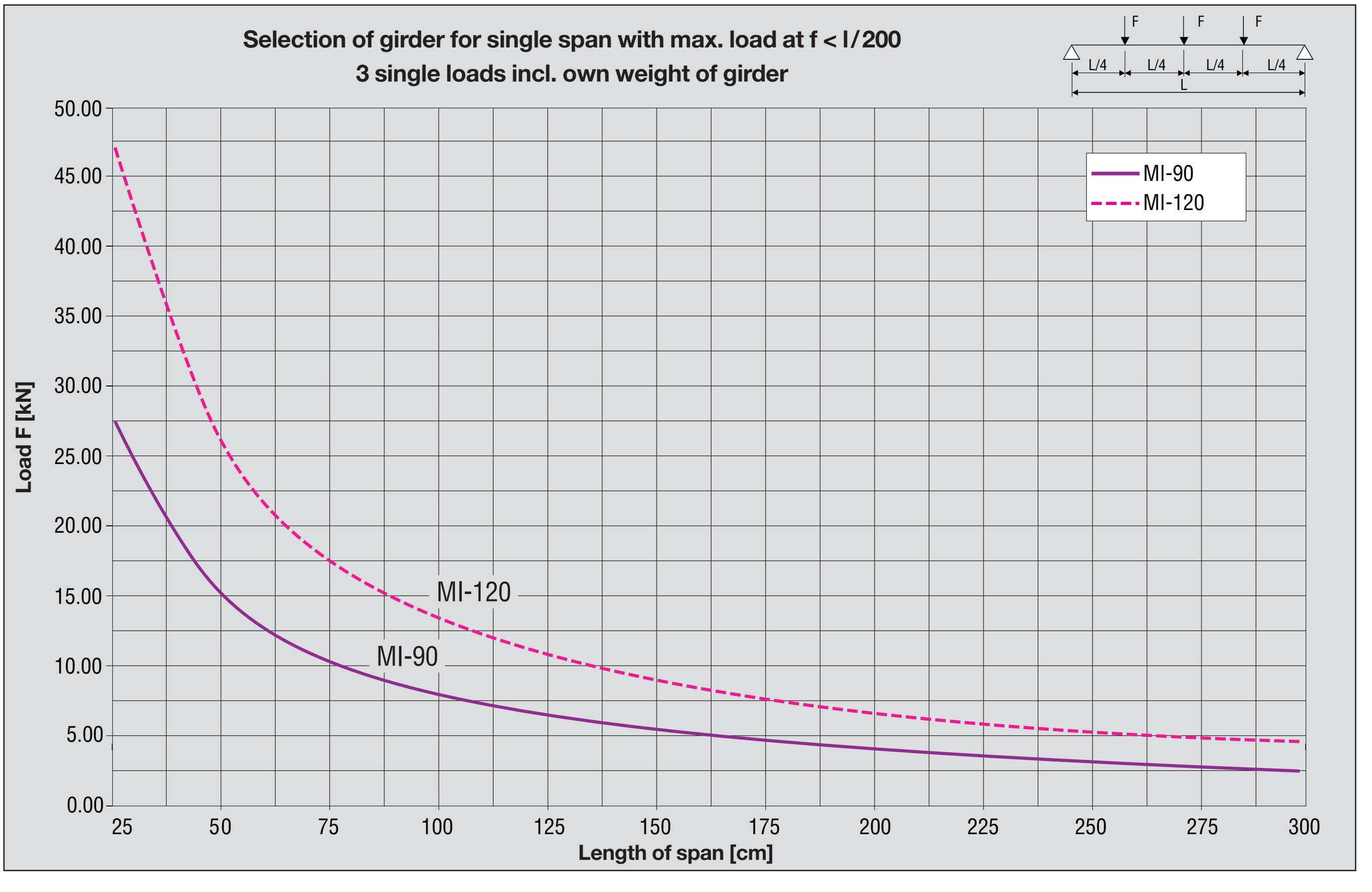
Single-span with bending load in one axis





Single-span with bending load in one axis

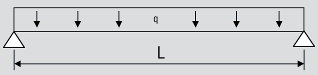


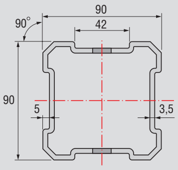


Single-span with bending load in two axes ($F_y = F_z * 0.15$)

F_1 at f = L/200, F_2 at f = L/300, F at $\sigma_{per.}$ incl. own weight of girder

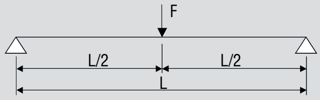
MI-90, uniformly distributed load

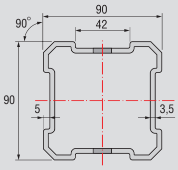




Length of span [cm]	q [kN/m]	F [kN]	f [mm] ≤ σ_{zul}	F1 [kN]	f [mm] ≤l/200	F2 [kN]	f [mm] ≤l/300
25	435.11	108.78	< 0.1	–	–	–	–
50	108.75	54.38	0.4	–	–	–	–
75	48.29	36.22	0.8	–	–	–	–
100	27.13	27.13	1.5	–	–	–	–
125	17.34	21.67	2.3	–	–	–	–
150	12.01	18.02	3.3	–	–	–	–
175	8.81	15.41	4.5	–	–	–	–
200	6.72	13.45	5.9	–	–	–	–
225	5.30	11.92	7.4	–	–	–	–
250	4.28	10.69	9.2	–	–	9.70	8.3
275	3.52	9.68	11.1	–	–	7.95	9.2
300	2.95	8.84	13.2	–	–	6.62	10.0
325	2.50	8.12	15.5	–	–	5.58	10.8
350	2.14	7.50	18.0	7.28	17.5	4.75	11.7
375	1.86	6.96	20.7	6.28	18.8	4.07	12.5
400	1.62	6.49	23.6	5.45	20.0	3.52	13.3
425	1.43	6.07	26.6	4.77	21.3	3.05	14.2
450	1.27	5.70	29.9	4.19	22.5	2.66	15.0
475	1.13	5.36	33.3	3.70	23.8	2.32	15.8
500	1.01	5.05	37.0	3.27	25.0	2.03	16.7
525	0.91	4.77	40.8	2.90	26.3	1.78	17.5
550	0.82	4.52	44.8	2.58	27.5	1.56	18.3
575	0.75	4.28	49.0	2.30	28.8	1.36	19.2
600	0.68	4.07	53.5	2.05	30.0	1.19	20.0

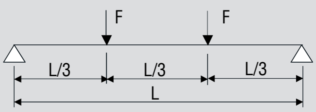
MI-90, one single load

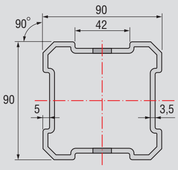




Length of span [cm]	F [kN]	f [mm] ≤ σ_{zul}	F1 [kN]	f [mm] ≤l/200	F2 [kN]	f [mm] ≤l/300
25	51.84	< 0.1	–	–	–	–
50	26.85	0.3	–	–	–	–
75	18.01	0.7	–	–	–	–
100	13.52	1.2	–	–	–	–
125	10.81	1.8	–	–	–	–
150	9.00	2.6	–	–	–	–
175	7.70	3.6	–	–	–	–
200	6.72	4.7	–	–	–	–
225	5.95	6.0	–	–	–	–
250	5.34	7.4	–	–	–	–
275	4.84	8.9	–	–	–	–
300	4.42	10.6	–	–	4.14	10.0
325	4.06	12.5	–	–	3.49	10.8
350	3.75	14.6	–	–	2.97	11.7
375	3.48	16.7	–	–	2.55	12.5
400	3.24	19.1	–	–	2.20	13.3
425	3.04	21.6	2.98	21.3	1.91	14.2
450	2.85	24.3	2.62	22.5	1.66	15.0
475	2.68	27.1	2.31	23.8	1.45	15.8
500	2.53	30.2	2.05	25.0	1.27	16.7
525	2.39	33.4	1.82	26.3	1.11	17.5
550	2.26	36.7	1.61	27.5	0.97	18.3
575	2.14	40.3	1.44	28.8	0.85	19.2
600	2.03	44.0	1.28	30.0	0.74	20.0

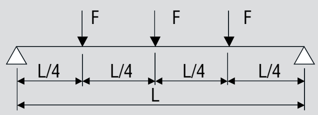
MI-90, two single loads

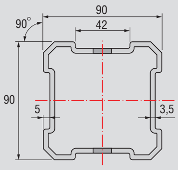




Length of span [cm]	F [kN]	f [mm] ≤ σ_{zul}	F1 [kN]	f [mm] ≤l/200	F2 [kN]	f [mm] ≤l/300
25	36.81	< 0.1	–	–	–	–
50	19.83	0.4	–	–	–	–
75	13.41	0.8	–	–	–	–
100	10.10	1.5	–	–	–	–
125	8.09	2.3	–	–	–	–
150	6.74	3.4	–	–	–	–
175	5.77	4.6	–	–	–	–
200	5.03	6.0	–	–	–	–
225	4.46	7.6	–	–	4.42	7.5
250	4.00	9.4	–	–	3.56	8.3
275	3.63	11.3	–	–	2.92	9.2
300	3.31	13.5	–	–	2.43	10.0
325	3.04	15.8	–	–	2.05	10.8
350	2.81	18.4	2.67	17.5	1.74	11.7
375	2.61	21.1	2.30	18.8	1.49	12.5
400	2.43	24.0	2.00	20.0	1.29	13.3
425	2.28	27.2	1.75	21.3	1.12	14.2
450	2.14	30.5	1.54	22.5	0.98	15.0
475	2.01	34.0	1.36	23.8	0.85	15.8
500	1.89	37.7	1.20	25.0	0.75	16.7
525	1.79	41.6	1.07	26.3	0.65	17.5
550	1.69	45.7	0.95	27.5	0.57	18.3
575	1.61	50.5	0.84	28.8	0.50	19.2
600	1.53	54.5	0.75	30.0	0.43	20.0

MI-90, three single loads



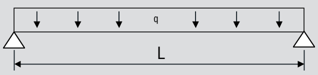


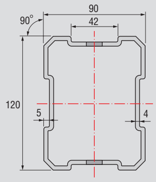
Length of span [cm]	F [kN]	f [mm] ≤ σ_{zul}	F1 [kN]	f [mm] ≤l/200	F2 [kN]	f [mm] ≤l/300
25	24.55	< 0.1	–	–	–	–
50	13.23	0.3	–	–	–	–
75	8.95	0.8	–	–	–	–
100	6.75	1.4	–	–	–	–
125	5.41	2.2	–	–	–	–
150	4.52	3.1	–	–	–	–
175	3.87	4.2	–	–	–	–
200	3.39	5.5	–	–	–	–
225	3.01	7.0	–	–	–	–
250	2.71	8.7	–	–	2.60	8.3
275	2.47	10.5	–	–	2.15	9.2
300	2.26	12.5	–	–	1.81	10.0
325	2.09	14.6	–	–	1.54	10.8
350	1.94	17.0	1.92	17.5	1.32	11.7
375	1.81	19.5	1.65	18.8	1.15	12.5
400	1.69	22.1	1.44	20.0	1.01	13.3
425	1.59	25.0	1.25	21.3	0.89	14.2
450	1.50	28.0	1.10	22.5	0.80	15.0
475	1.42	31.1	0.97	23.8	0.71	15.8
500	1.35	34.5	0.86	25.0	0.64	16.7
525	1.29	38.0	0.76	26.3	0.58	17.5
550	1.23	41.7	0.68	27.5	0.53	18.3
575	1.17	45.5	0.60	28.8	0.48	19.2
600	1.12	49.5	0.54	30.0	0.44	20.0

Single-span with bending load in two axes ($F_y = F_z*0.15$)

F_1 bei f = L/200, F_2 bei f = L/300, F bei σ_{zul} incl. own weight of girder

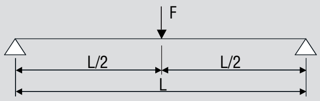
MI-120, uniformly distributed load

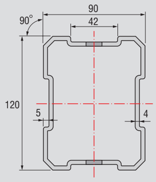




Length of span [cm]	q [kN/m]	F [kN]	f [mm] ≤ σ_{zul}	F1 [kN]	f [mm] ≤l/200	F2 [kN]	f [mm] ≤l/300
25	737.75	184.44	< 0.1	–	–	–	–
50	184.42	92.21	0.3	–	–	–	–
75	81.91	61.43	0.6	–	–	–	–
100	46.03	46.03	1.1	–	–	–	–
125	29.42	36.78	1.7	–	–	–	–
150	20.40	30.60	2.4	–	–	–	–
175	14.96	26.18	3.3	–	–	–	–
200	11.43	22.86	4.3	–	–	–	–
225	9.01	20.27	5.5	–	–	–	–
250	7.28	18.20	6.7	–	–	–	
275	6.00	16.49	8.2	–	–	–	–
300	5.02	15.07	9.7	–	–	–	–
325	4.26	13.86	11.4	–	–	13.14	10.8
350	3.66	12.82	13.2	–	–	11.24	11.7
375	3.18	11.92	15.2	–	–	9.71	12.5
400	2.78	11.12	17.3	–	–	8.45	13.3
425	2.45	10.42	19.6	–	–	7.40	14.2
450	2.18	9.79	22.0	–	–	6.51	15.0
475	1.94	9.22	24.5	8.93	23.8	5.76	15.8
500	1.74	8.71	27.2	7.97	25.0	5.11	16.7
525	1.57	8.25	30.0	7.14	26.3	4.55	17.5
550	1.42	7.82	32.9	6.42	27.5	4.06	18.3
575	1.29	7.43	36.0	5.79	28.8	3.63	19.2
600	1.18	7.07	39.3	5.23	30.0	3.25	20.0

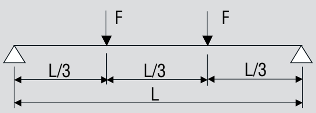
MI-120, one single load

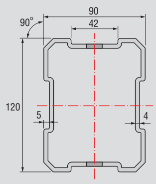




Length of span [cm]	F [kN]	f [mm] ≤ σ_{zul}	F1 [kN]	f [mm] ≤l/200	F2 [kN]	f [mm] ≤l/300
25	87.91	< 0.1	–	–	–	–
50	45.53	0.2	–	–	–	–
75	30.54	0.5	–	–	–	–
100	22.94	0.9	–	–	–	–
125	18.35	1.3	–	–	–	–
150	15.28	1.9	–	–	–	–
175	13.08	2.6	–	–	–	–
200	11.42	3.5	–	–	–	–
225	10.13	4.4	–	–	–	–
250	9.09	5.4	–	–	–	–
275	8.24	6.6	–	–	–	–
300	7.53	7.8	–	–	–	–
325	6.93	9.2	–	–	–	–
350	6.41	10.7	–	–	–	–
375	5.96	12.3	–	–	–	–
400	5.56	14.0	–	–	5.28	13.3
425	5.21	15.8	–	–	4.62	14.2
450	4.89	17.8	–	–	4.07	15.0
475	4.61	19.9	–	–	3.60	15.8
500	4.36	22.1	–	–	3.20	16.7
525	4.12	24.4	–	–	2.85	17.5
550	3.91	26.9	–	–	2.54	18.3
575	3.72	29.4	3.62	28.8	2.27	19.2
600	3.54	32.1	3.27	30.0	2.03	20.0

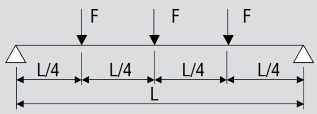
MI-120, two single loads

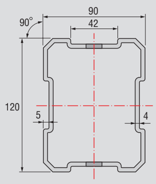




Length of span [cm]	F [kN]	f [mm] ≤ σ_{zul}	F1 [kN]	f [mm] ≤l/200	F2 [kN]	f [mm] ≤l/300
25	62.44	< 0.1	–	–	–	–
50	33.63	0.3	–	–	–	–
75	22.75	0.6	–	–	–	–
100	17.14	1.1	–	–	–	–
125	13.73	1.7	–	–	–	–
150	11.44	2.5	–	–	–	–
175	9.80	3.4	–	–	–	–
200	8.56	4.4	–	–	–	–
225	7.59	5.6	–	–	–	–
250	6.82	6.9	–	–	–	–
275	6.18	8.3	–	–	–	–
300	5.65	9.9	–	–	–	–
325	5.19	11.7	–	–	4.82	10.8
350	4.81	13.5	–	–	4.12	11.7
375	4.47	15.5	–	–	3.56	12.5
400	4.17	17.7	–	–	3.10	13.3
425	3.91	20.0	–	–	2.71	14.2
450	3.67	22.4	–	–	2.39	15.0
475	3.46	25.0	3.28	23.8	2.11	15.8
500	2.27	27.7	2.92	25.0	1.88	16.7
525	3.09	30.6	2.62	26.3	1.67	17.5
550	2.93	33.6	2.36	27.5	1.49	18.3
575	2.79	36.8	2.12	28.8	1.33	19.2
600	2.65	40.1	1.92	30.0	1.19	20.0

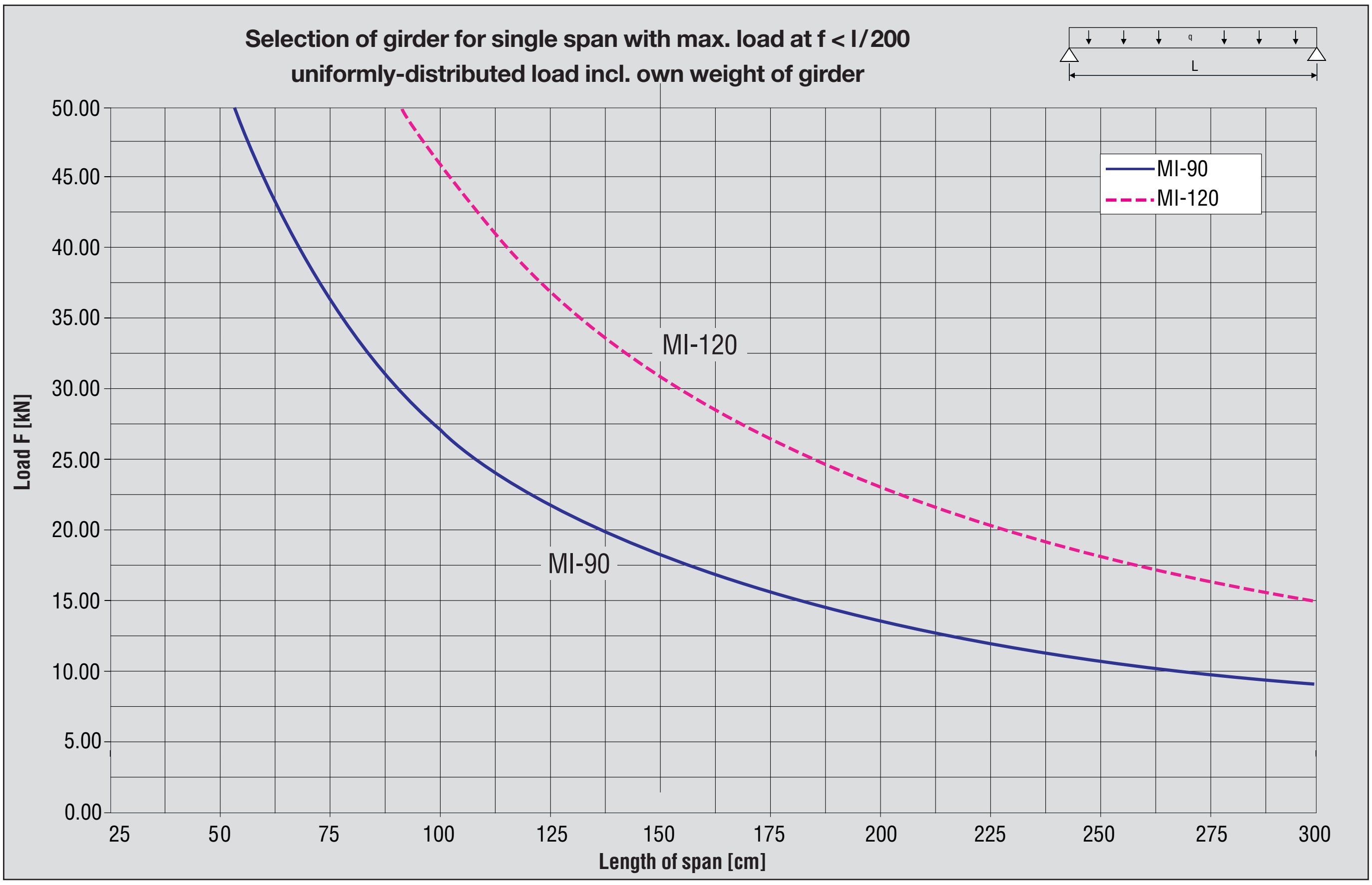
MI-120, three single loads

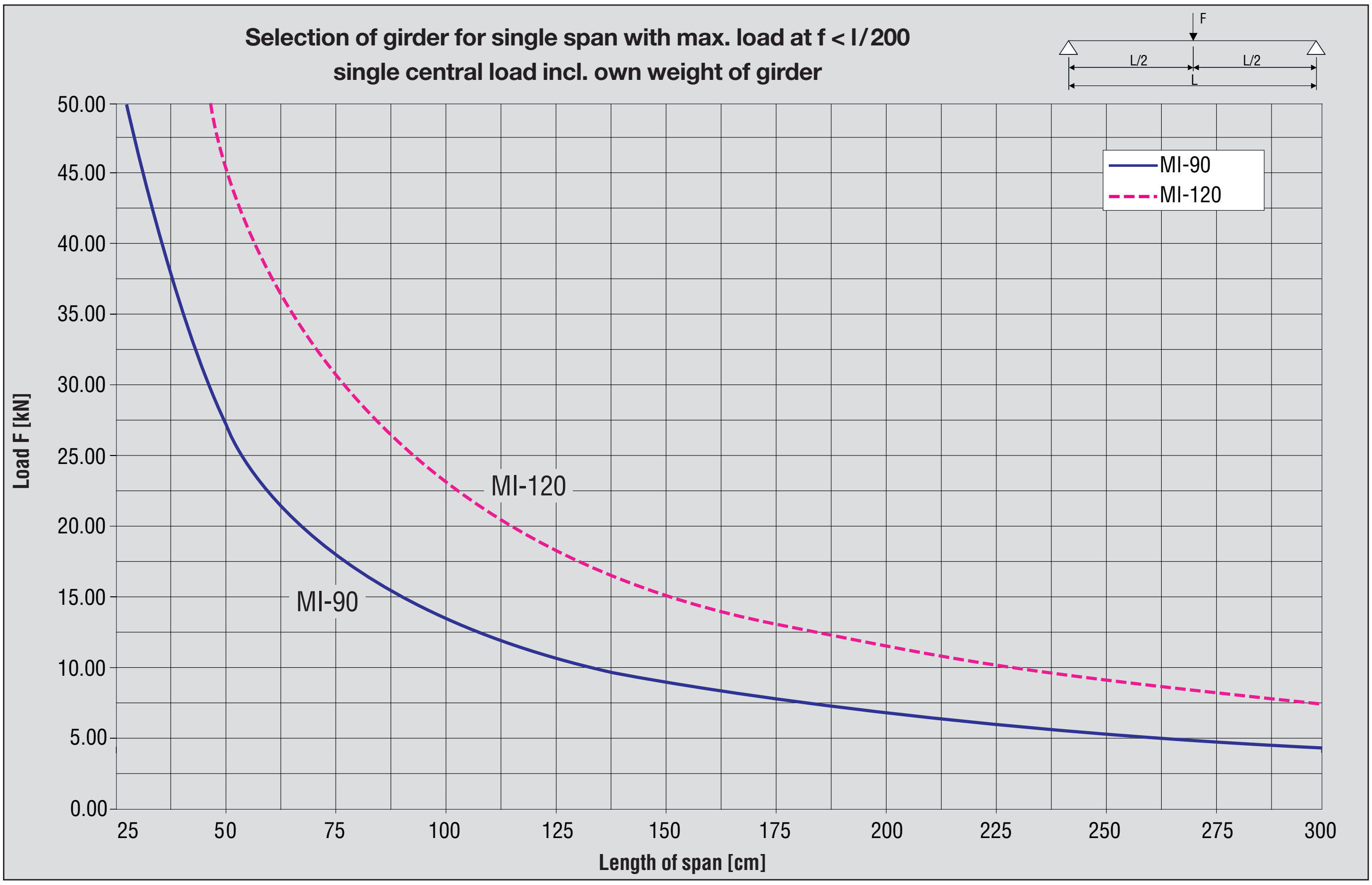




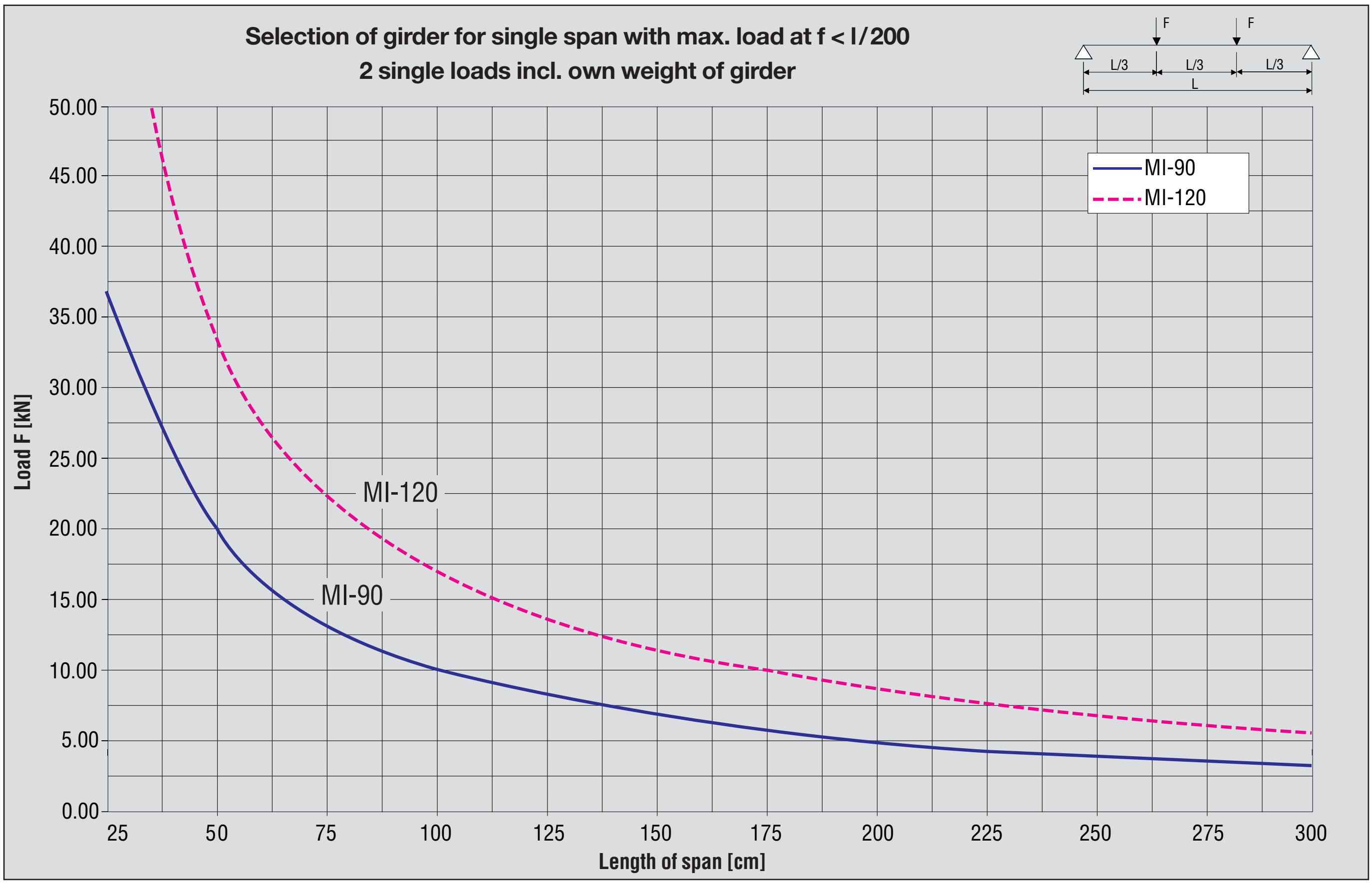
Length of span [cm]	F [kN]	f [mm] ≤ σ_{zul}	F1 [kN]	f [mm] ≤l/200	F2 [kN]	f [mm] ≤l/300
25	41.63	< 0.1	–	–	–	–
50	22.43	0.2	–	–	–	–
75	15.18	0.6	–	–	–	–
100	11.45	1.0	–	–	–	–
125	9.18	1.6	–	–	–	–
150	7.66	2.3	–	–	–	–
175	6.57	3.1	–	–	–	–
200	5.75	4.1	–	–	–	–
225	5.11	5.2	–	–	–	–
250	4.60	6.4	–	–	–	–
275	4.18	7.7	–	–	–	–
300	3.83	9.2	–	–	–	–
325	3.54	10.8	–	–	–	–
350	3.28	12.5	–	–	3.06	11.7
375	3.06	14.3	–	–	2.66	12.5
400	2.87	16.3	–	–	2.34	13.3
425	2.70	18.4	–	–	2.07	14.2
450	2.55	20.6	–	–	1.84	15.0
475	2.41	22.9	2.35	23.8	1.65	15.8
500	2.29	25.4	2.10	25.0	1.49	16.7
525	2.18	28.0	1.88	26.3	1.35	17.5
550	2.08	30.7	1.69	27.5	1.23	18.3
575	1.99	33.5	1.52	28.8	1.12	19.2
600	1.91	36.5	1.38	30.0	1.03	20.0

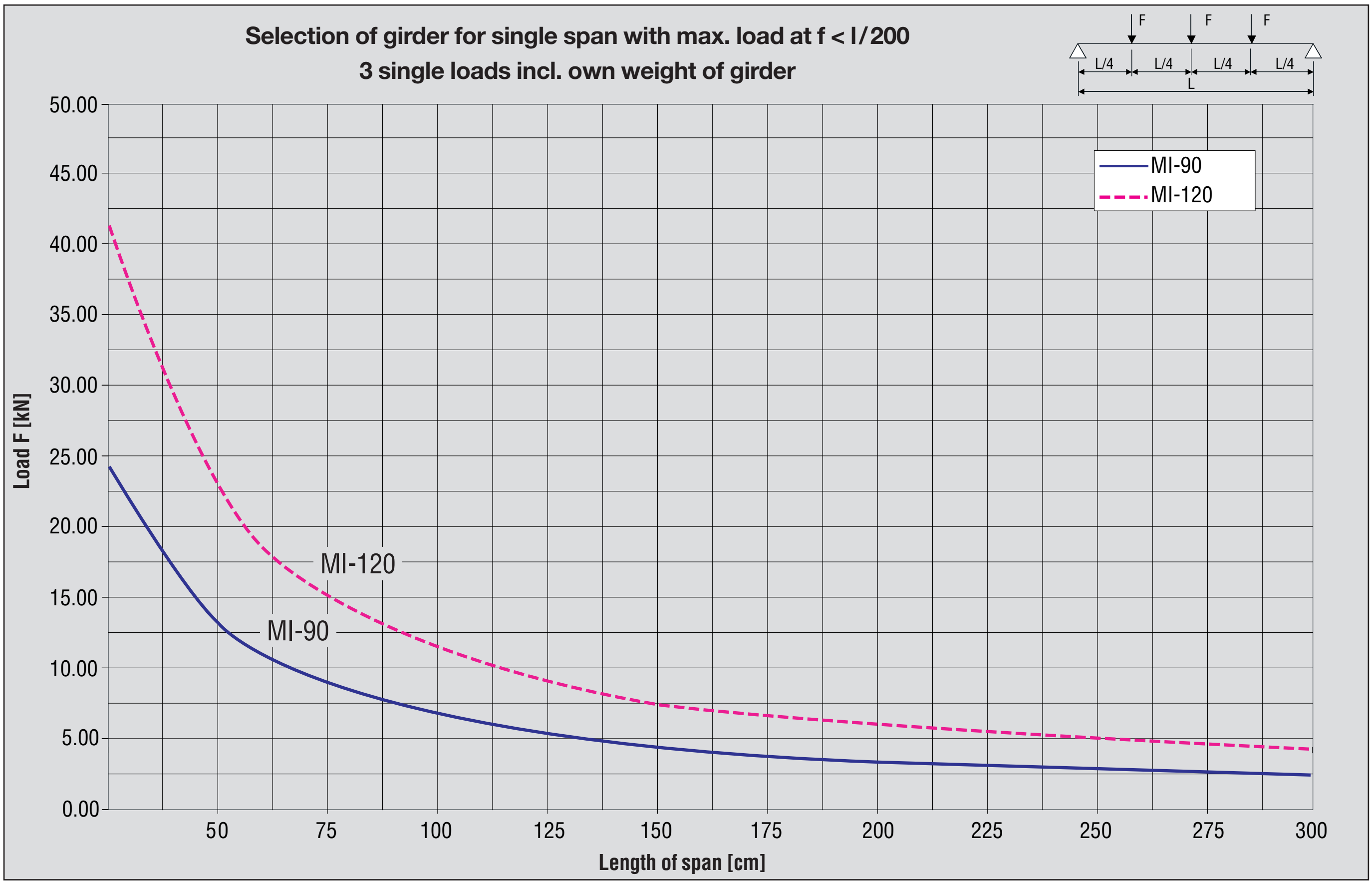
Single-span with bending load in two axes ($F_y = F_z*0.15$)





Single-span with bending load in two axes ($F_y = F_z$*0.15)

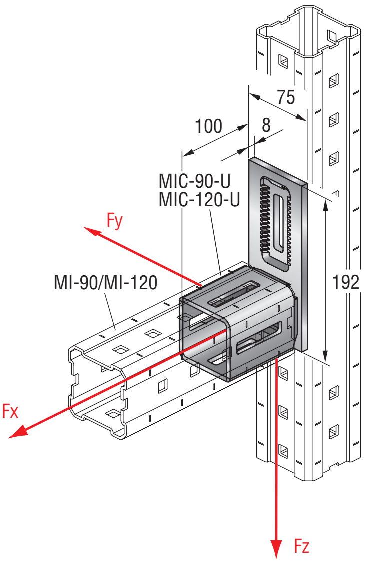




MIC-90 / 120-U crossbeam connector (rec. loads)

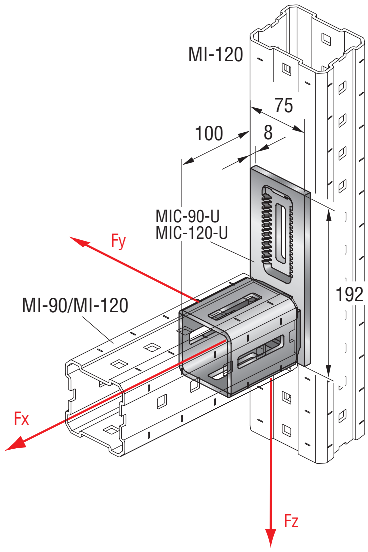
MIC-90-U or MIC-120-U on MI-90 girder

Loading:	± Fy_{rec} [kN]	± Fx_{rec} [kN]	± Fz_{rec} [kN]
Fy+Fx+Fz	9.70	1.70	12.00



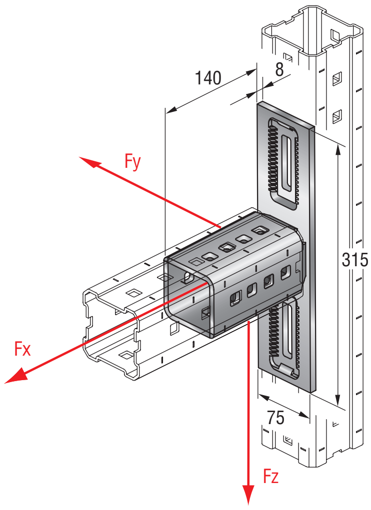
MIC-90-U or MIC-120-U on MI-120 girder

Loading:	± Fy_{rec} [kN]	± Fx_{rec} [kN]	± Fz_{rec} [kN]
Fy+Fx+Fz	10.30	1.70	13.70



MIC-90-L cantilever connector (rec. loads)

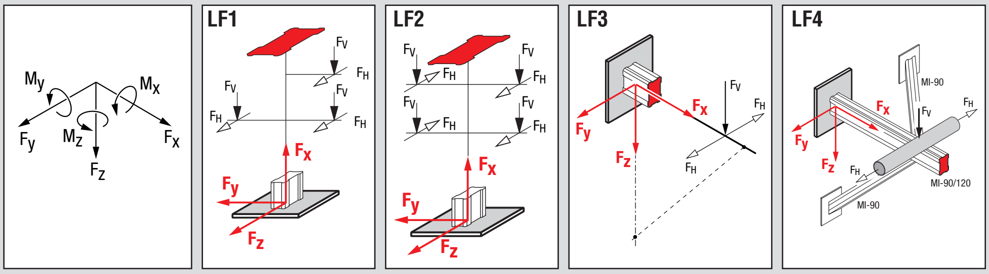
MIC-90-L on MI-90 or MI-120 girder



Loading:	± Fy_{rec} [kN]	± Fx_{rec} [kN]	± Fz_{rec} [kN]	± My_{rec} [kNm]	± Mx_{rec} [kNm]	± Mz_{rec} [kNm]
Fx		8.26				
Fy // Fz*	13.20		18.60			
Fy + Fz	13.20		18.60			
Mz	0.60					0.15
My			5.08	0.67		
FxMy		3.51		0.67		
FxMz	0.40	1.40				0.10
Mx	2.50				0.50	
Mx			2.50		0.50	
LF1	13.20	3.10	18.60	0.67	0.10	
LF2a		6.30	2.00		0.50	
LF2b	2.00	6.30			0.50	
LF3 oST	0.38		2.50	0.55	0.03	0.08

*Only loading in one direction is permissible (// = or).

Moments and loading configurations



F_V = vertical load
F_H = horizontal load

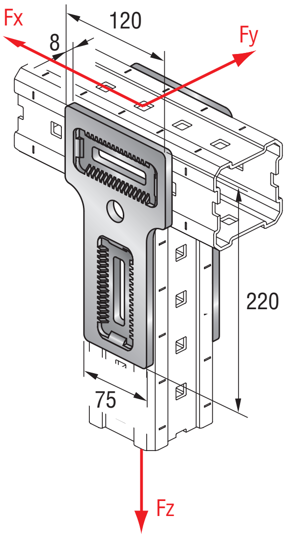
LF = loading configuration

LF2a = Moment M_x induced by F_z
LF2b = Moment M_x induced by F_y

LF3ST = cantilever with support
LF3oST = cantilever without support

MIC-T pedestal connector (rec. loads)

MIC-T
on MI-90 and MI-120

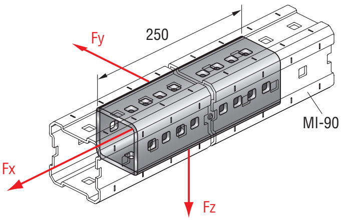


Loading:	± Fy_{rec} [kN]	± Fx_{rec} [kN]	± Fz_{rec} [kN]
max Fx	–	1.40	–
max Fy	9.80	–	–
max Fz	–	–	20.00
max Fy+Fz	6.00	–	10.00
max Fx+Fy+Fz	3.50	1.00	10.00
max Fx+Fy+Fz	6.00	0.75	10.00

Loads apply only when used in pairs.

MIC-90 / 120-E girder extension (rec. loads)

MIC-90-E
MI-90 extension



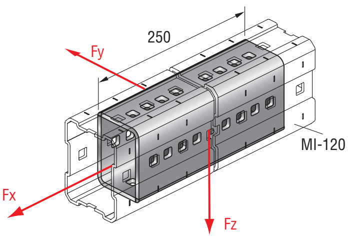
Loading:	± Fy_{rec} [kN]	± Fx_{rec} [kN]	± Fz_{rec} [kN]	± My_{rec} [kNm]	± Mx_{rec} [kNm]	± Mz_{rec} [kNm]
Fx		34.00				
Fy // Fz**	4.90*		4.90*			
Fy + Fz	4.90*		4.90*			
Mz						1.20
My				1.20		
Mx					1.82	
LF5	4.90*		4.90*	1.20		1.20

The end of each girder must be fastened with 4 bolts inserted crosswise.

* The loads apply to a max. span length of 100 cm. For information on greater span lengths, please contact our technical consultancy service.

** Loading permissible in only one direction (// = or).

MIC-120-E
MI-120 extension



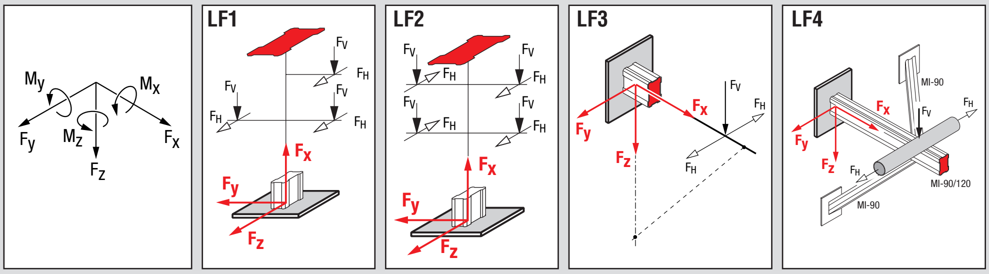
Loading:	± Fy_{rec} [kN]	± Fx_{rec} [kN]	± Fz_{rec} [kN]	± My_{rec} [kNm]	± Mx_{rec} [kNm]	± Mz_{rec} [kNm]
Fx		38.60				
Fy // Fz**	4.90*		8.20*			
Fy + Fz	4.90*		8.20*			
Mz						1.20
My				2.00		0.67
Mx					2.48	
LF5	4.90*		8.20*	2.00		1.20

The end of each girder must be fastened with 4 bolts inserted crosswise.

* The loads apply to a max. span length of 100 cm. For information on greater span lengths, please contact our technical consultancy service.

** Loading permissible in only one direction (// = or).

Moments and loading configurations



F_V = vertical load
F_H = horizontal load

LF = loading configuration

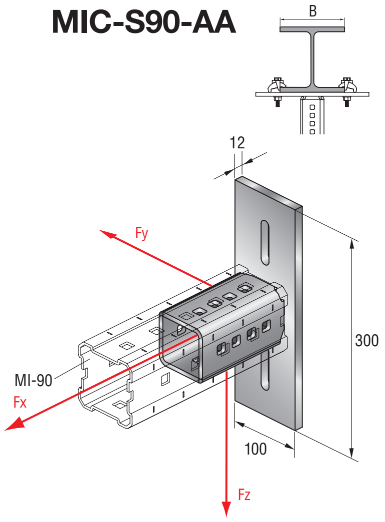
LF2a = Moment M_X induced by F_Z
LF2b = Moment M_X induced by F_y

LF3ST = cantilever with support
LF3oST = cantilever without support

LF5 = combined loading through simultaneous action in F_y and F_Z.

MIC-S90-AA / A connector on steel beam (rec. loads)

MIC-S90-AA

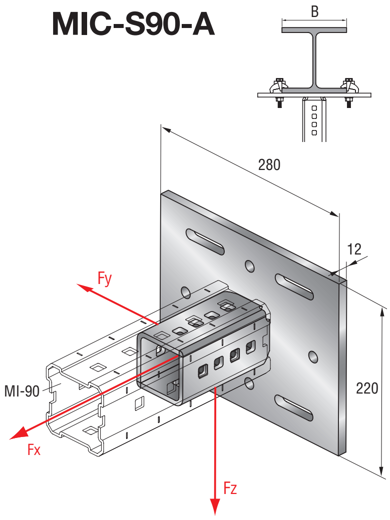


Loading:	± Fy rec [kN]	± Fx rec [kN]	± Fz rec [kN]	± My rec [kNm]	± Mx rec [kNm]	± Mz rec [kNm]
Fx		9.00				
Fy // Fz*	3.00		3.00			
Fy + Fz	2.12		2.12			
Mz	2.20					0.50
My			2.20	0.55		
FxMy		5.00	1.60	0.40		
FxMz	1.20	5.00				0.30
Mx	0.50				0.10	
Mx			0.50		0.10	
LF1	1.56	5.00	1.56	0.40		

Loading permissible in only one direction (// = or).

Fastened with two MI-GC-M12 beam clamps (see individual parts).

MIC-S90-A



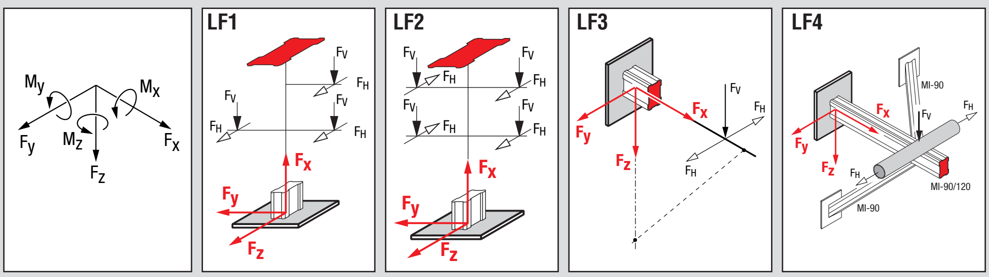
Loading:	± Fy rec [kN]	± Fx rec [kN]	± Fz rec [kN]	± My rec [kNm]	± Mx rec [kNm]	± Mz rec [kNm]
Fx		14.70				
Fy // Fz*	6.00		6.00			
Fy + Fz	4.24		4.24			
My			4.40	0.67 **(0.88)**		
Mz	2.40					0.60
FxMz	4.00	5.00				0.67
FxMy		5.00	4.40	0.66		
Mx			0.80		0.47	
Mx	0.80				0.47	
LF1a	1.40	5.00	1.40	0.42	0.21	0.42
LF1b	1.40	5.00	1.40	0.67	0.21	0.45
LF2a		8.70	1.10		0.28	
LF2b	1.10	8.70			0.28	
LF3 oST	0.66		4.30	0.67 **(0.80)**		0.12
LF3 ST	1.49	7.00	4.14			0.67
LF4	3.11	14.70	3.11			

Fastened with four MI-GC-M12 beam clamps (see individual parts). Values in brackets ( ) apply to use of three bolts in square sections, two inserted in the direction of the horizontal force and one at 90° (also see MI applications).

Note: The third bolt (MIA-OH-90 304889) must be ordered additionally.

Loading permissible in only one direction (// = or).

Moments and loading configurations



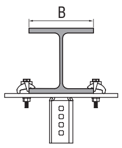
F_V = vertical load
F_H = horizontal load

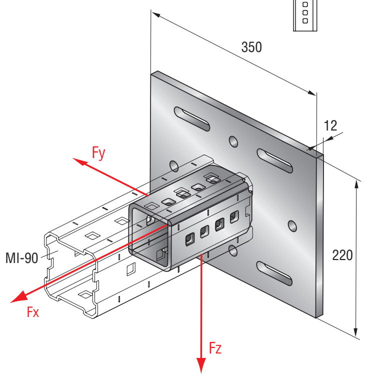
LF = loading configuration

LF1a/b = different loads, see tables
LF2a = Moment M_x induced by F_z
LF2b = Moment M_x induced by F_y
LF3ST = cantilever with support
LF3oST = cantilever without support

MIC-S90-B / C connector on steel beam (rec. loads)

MIC-S90-B





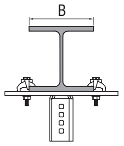
Loading:	± Fy_{rec} [kN]	± Fx_{rec} [kN]	± Fz_{rec} [kN]	± My_{rec} [kNm]	± Mx_{rec} [kNm]	± Mz_{rec} [kNm]
Fx		10.20				
Fy // Fz*	6.00		6.00			
Fy + Fz	4.24		4.24			
My			4.40	0.67 **(0.88)**		
Mz	3.20					0.67
FxMz	4.00	5.00				0.60
FxMy		5.00	4.40	0.63		
Mx			1.86		0.47	
Mx	1.86				0.47	
LF1a	1.73	4.35	1.73	0.35	0.21	0.35
LF1b	1.73	3.70	1.73	0.67	0.21	0.28
LF2a		8.70	1.35		0.34	
LF2b	1.35	8.70			0.34	
LF3 oST	0.66		4.40	0.67 **(0.85)**		0.13
LF3 ST	1.49	4.76	4.14			0.63
LF4	3.11	10.20	3.11			

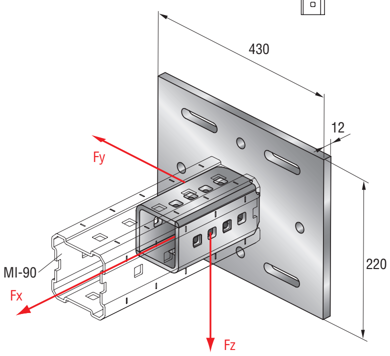
Fastened with four MI-GC-M12 beam clamps (see individual parts). Values in brackets ( ) apply to use of three bolts in square sections, two inserted in the direction of the horizontal force and one at 90° (also see MI applications).

Note: The third bolt (MIA-OH-90 304889) must be ordered additionally.

Loading permissible in only one direction (// = or).

MIC-S90-C





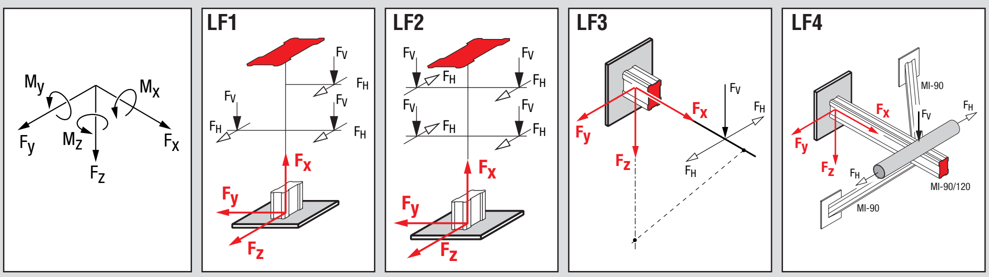
Loading:	± Fy_{rec} [kN]	± Fx_{rec} [kN]	± Fz_{rec} [kN]	± My_{rec} [kNm]	± Mx_{rec} [kNm]	± Mz_{rec} [kNm]
Fx		7.20				
Fy // Fz*	6.00		6.00			
Fy + Fz	4.24		4.24			
My			4.00	0.67 **(0.88)**		
Mz	3.80					0.67
FxMz	4.00	4.10				0.50
FxMy		3.40	4.40	0.66		
Mx			2.10		0.53	
Mx	2.10				0.53	
LF1a	2.00	3.56	0.90	0.28	0.21	0.28
LF1b	2.00	3.00	0.90	0.59	0.21	0.23
LF2a		7.20	1.13		0.47	
LF2b	1.13	7.20			0.47	
LF3 oST	0.66		4.40	0.67 **(0.88)**		0.14 **(0.45)**
LF3 ST	1.49	3.87	4.14			0.51 **(0.78)**
LF4	3.11	7.20	3.11			

Fastened with four MI-GC-M12 beam clamps (see individual parts). Values in brackets ( ) apply to use of three bolts in square sections, two inserted in the direction of the horizontal force and one at 90° (also see MI applications).

Note: The third bolt (MIA-OH-90 304889) must be ordered additionally.

Loading permissible in only one direction (// = or).

Moments and loading configurations



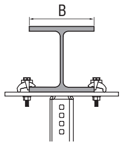
F_V = vertical load
F_H = horizontal load

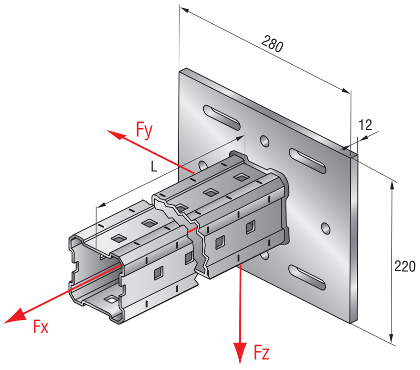
LF = loading configuration

LF1a/b = different loads, see tables
LF2a = Moment M_X induced by F_Z
LF2b = Moment M_X induced by F_y
LF3ST = cantilever with support
LF3oST = cantilever without support

MIC-S90-A / B-xxx welded bracket - connector on steel beam (rec. loads)

MIC-S90-A-500 -750 -1000 -1500 -2000



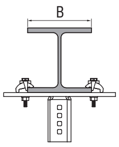


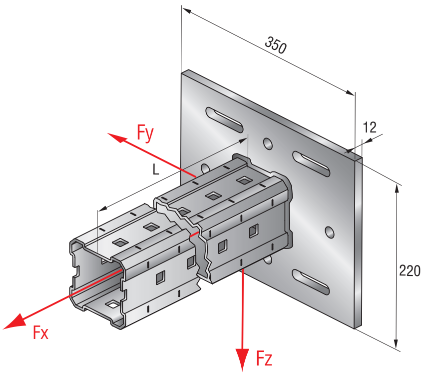
Loading:	± Fyrec [kN]	± Fxrec [kN]	± Fzrec [kN]	± Myrec [kNm]	± Mxrec [kNm]	± Mzrec [kNm]
Fx		18.80				
Fy // Fz*	6.00		6.00			
Fy + Fz	4.24		4.24			
My			4.40	1.40		
Mz	4.00					1.00
FxMz	4.40	7.60				1.10
FxMy		6.90	4.00	1.00		
Mx			2.10		0.53	
Mx	2.10				0.53	
LF1a	2.00	7.40	2.00	0.60	0.21	0.60
LF1b	2.00	7.40	2.00	0.60	0.21	0.60
LF2a		15.00	1.13		0.47	
LF2b	1.13	15.00			0.47	
LF3 oST	0.66		4.40	1.10		0.17
LF3 ST	1.49	7.00	4.14			1.10
LF4	3.11	18.80	3.11			

Fastened with four MI-GC-M12 beam clamps (see individual parts).

Loading permissible in only one direction (// = or).

MIC-S90-B-500 -750 -1000 -1500 -2000



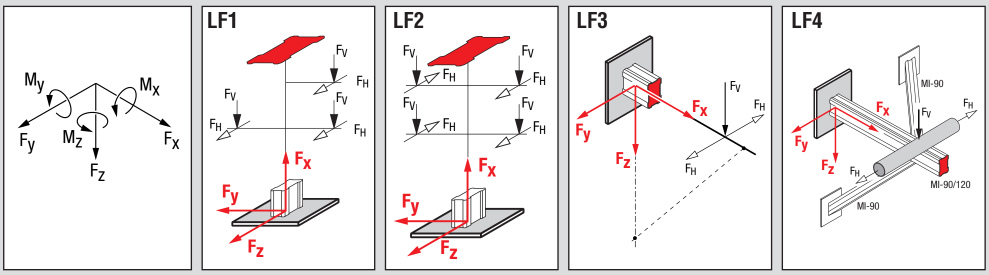


Loading:	± Fyrec [kN]	± Fxrec [kN]	± Fzrec [kN]	± Myrec [kNm]	± Mxrec [kNm]	± Mzrec [kNm]
Fx		11.70				
Fy // Fz*	6.00		6.00			
Fy + Fz	4.24		4.24			
My			4.40	1.40		
Mz	4.40					1.10
FxMz	4.00	5.10				0.90
FxMy		5.00	4.00	0.80		
Mx			2.10		0.53	
Mx	2.10				0.53	
LF1a	2.00	5.00	2.00	0.50	0.21	0.50
LF1b	2.00	5.00	2.00	0.50	0.21	0.50
LF2a		11.70	1.13		0.47	
LF2b	1.13	11.70			0.47	
LF3 oST	0.66		4.40	0.90		0.14
LF3 ST	1.49	5.70	4.14			0.80
LF4	3.11	11.70	3.11			

Fastened with four MI-GC-M12 beam clamps (see individual parts).

Loading permissible in only one direction (// = or).

Moments and loading configurations



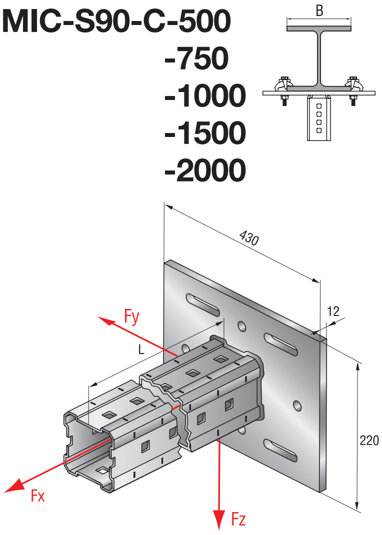
F_V = vertical load
F_H = horizontal load

LF = loading configuration

LF1a/b = different loads, see tables
LF2a = Moment M_x induced by F_z
LF2b = Moment M_x induced by F_y
LF3ST = cantilever with support
LF3oST = cantilever without support

MIC-S90-C-xxx welded bracket - connector on steel beam (rec. loads)

MIC-S90-C-500
-750
-1000
-1500
-2000

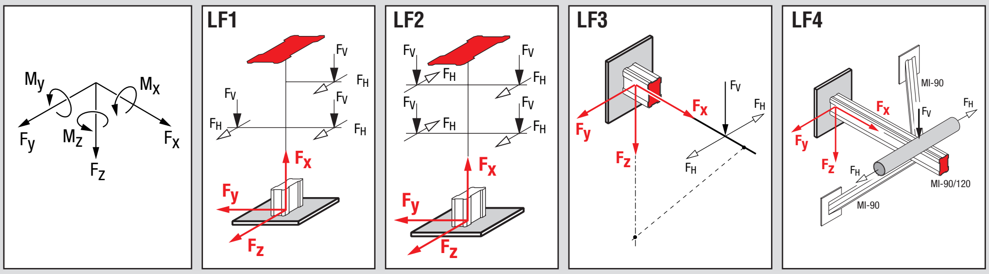


Loading:	± Fy_{rec} [kN]	± Fx_{rec} [kN]	± Fz_{rec} [kN]	± My_{rec} [kNm]	± Mx_{rec} [kNm]	± Mz_{rec} [kNm]
Fx		8.10				
Fy // Fz*	6.00		6.00			
Fy + Fz	4.24		4.24			
My			4.00	1.00		
Mz	4.40					1.10
FxMz	4.00	4.60				0.60
FxMy		4.00	4.00	0.60		
Mx			2.10		0.53	
Mx	2.10				0.53	
LF1a	2.00	3.90	2.00	0.40	0.21	0.40
LF1b	2.00	3.90	2.00	0.40	0.21	0.40
LF2a		8.10	1.13		0.47	
LF2b	1.13	8.10			0.47	
LF3 oST	0.66		4.40	0.90		0.14
LF3 ST	1.49	4.60	4.14			0.60
LF4	3.11	8.10	3.11			

Fastened with four MI-GC-M12 beam clamps (see individual parts).

Loading permissible in only one direction (// = or).

Moments and loading configurations



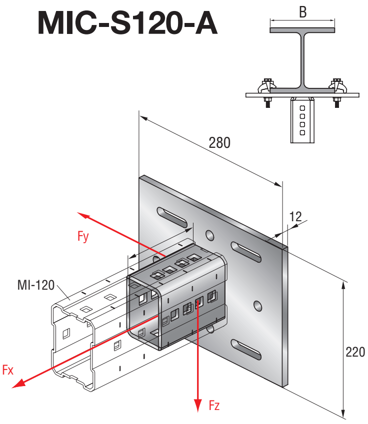
F_V = vertical load
F_H = horizontal load

LF = loading configuration

LF1a/b = different loads, see tables
LF2a = Moment M_x induced by F_z
LF2b = Moment M_x induced by F_y
LF3ST = cantilever with support
LF3oST = cantilever without support

MIC-S120-A / B / C connector on steel beam (rec. loads)

MIC-S120-A



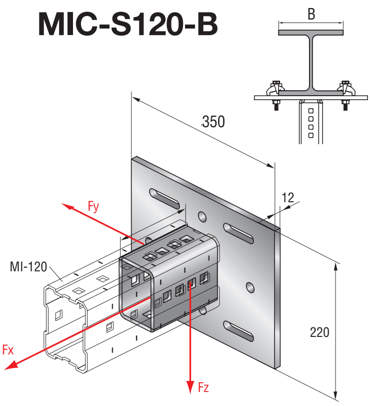
Loading:	± Fy_{rec} [kN]	± Fx_{rec} [kN]	± Fz_{rec} [kN]	± My_{rec} [kNm]	± Mx_{rec} [kNm]	± Mz_{rec} [kNm]
Fx		16.50				
Fy // Fz*	6.00		6.00			
Fy + Fz	4.24		4.24			
My			4.40	0.93 **(1.28)**		
Mz	2.80					0.67
FxMz	4.00	6.00				0.67
FxMy		6.09	4.40	0.77		
Mx			0.80		0.47	
Mx	0.80				0.47	
LF1a	1.40	6.00	1.40	0.49	0.21	0.49
LF1b	1.40	6.00	1.40	0.90	0.21	0.45
LF2a		9.70	1.10		0.28	
LF2b	1.10	9.70			0.28	
LF3 oST	0.66		4.30	0.93 **(1.00)**		0.15
LF3 ST	1.49	7.00	4.14			0.67
LF4	3.11	16.50	3.11			

Fastened with four MI-GC-M12 beam clamps (see individual parts). Values in brackets ( ) apply to use of three bolts in square sections, two inserted in the direction of the horizontal force and one at 90° (also see MI applications).

Note: The third bolt (MIA-OH-120 304890) must be ordered additionally.

Loading permissible in only one direction (// = or).

MIC-S120-B



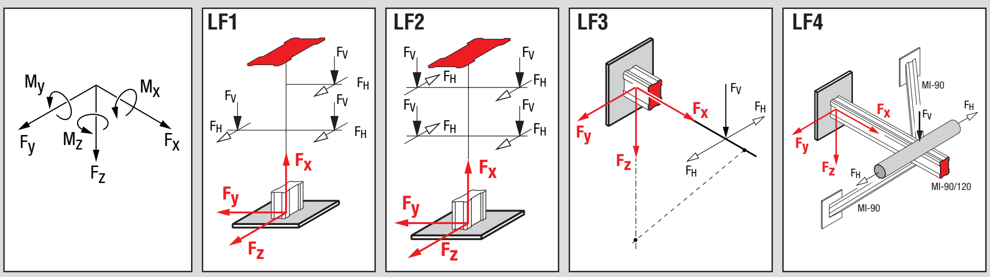
Loading:	± Fy_{rec} [kN]	± Fx_{rec} [kN]	± Fz_{rec} [kN]	± My_{rec} [kNm]	± Mx_{rec} [kNm]	± Mz_{rec} [kNm]
Fx		11.30				
Fy // Fz*	6.00		6.00			
Fy + Fz	4.24		4.24			
My			4.40	0.93 **(1.20)**		
Mz	4.40					0.67
FxMz	4.00	6.00				0.67
FxMy		6.20	4.40	0.63		
Mx			1.86		0.47	
Mx	1.86				0.47	
LF1a	1.73	4.35	1.73	0.35	0.21	0.35
LF1b	1.73	3.90	1.73	0.76	0.21	0.29
LF2a		9.70	1.35		0.34	
LF2b	1.35	9.70			0.34	
LF3 oST	0.66		4.40	0.93 **(1.00)**		0.15
LF3 ST	1.49	4.76	4.14			0.63
LF4	3.11	11.30	3.11			

Fastened with four MI-GC-M12 beam clamps (see individual parts). Values in brackets ( ) apply to use of three bolts in square sections, two inserted in the direction of the horizontal force and one at 90° (also see MI applications).

Note: The third bolt (MIA-OH-120 304890) must be ordered additionally.

Loading permissible in only one direction (// = or).

Moments and loading configurations



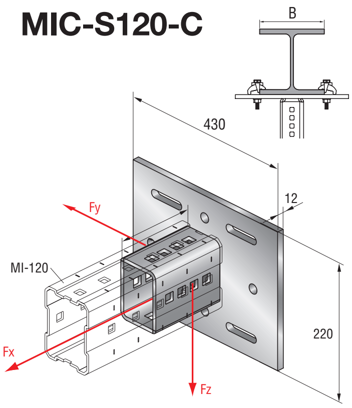
F_V = vertical load
F_H = horizontal load

LF = loading configuration

LF1a/b = different loads, see tables
LF2a = Moment M_X induced by F_Z
LF3ST = cantilever with support
LF2b = Moment M_X induced by F_y
LF3oST = cantilever without support

MIC-S120-C connector on steel beam (rec. loads)

MIC-S120-C



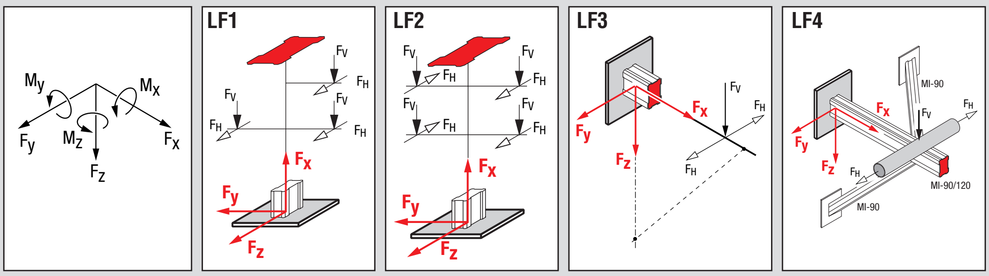
Loading:	± Fy_{rec} [kN]	± Fx_{rec} [kN]	± Fz_{rec} [kN]	± My_{rec} [kNm]	± Mx_{rec} [kNm]	± Mz_{rec} [kNm]
Fx		8.10				
Fy // Fz*	6.00		6.00			
Fy + Fz	4.24		4.24			
My			4.40	0.93 **(1.10)**		
Mz	4.00					0.67
FxMz	4.00	4.35				0.50
FxMy		3.70	4.40	0.72		
Mx			2.10		0.53	
Mx	2.10				0.53	
LF1a	2.00	3.56	0.90	0.28	0.21	0.28
LF1b	2.00	3.30	0.90	0.64	0.21	0.25
LF2a		8.10	1.13		0.47	
LF2b	1.13	8.10			0.47	
LF3 oST	0.66		4.40	0.93 **(1.00)**		0.15
LF3 ST	1.49	3.87	4.14			0.51
LF4	3.11	8.10	3.11			

Fastened with four MI-GC-M12 beam clamps (see individual parts). Values in brackets ( ) apply to use of three bolts in square sections, two inserted in the direction of the horizontal force and one at 90° (also see MI applications).

Note: The third bolt (MIA-OH-120 304890) must be ordered additionally.

Loading permissible in only one direction (// = or).

Moments and loading configurations



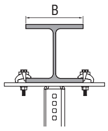
F_V = vertical load
F_H = horizontal load

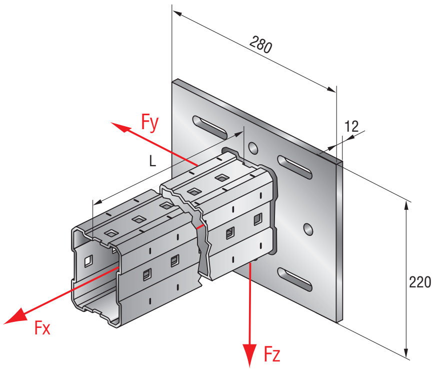
LF = loading configuration

LF1a/b = different loads, see tables
LF2a = Moment M_x induced by F_z
LF2b = Moment M_x induced by F_y
LF3ST = cantilever with support
LF3oST = cantilever without support

MIC-S120-A / B-xxx welded bracket - connector on steel beam (rec. loads)

MIC-S120-A-500 -750 -1000 -1500 -2000



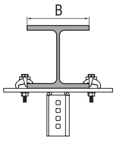


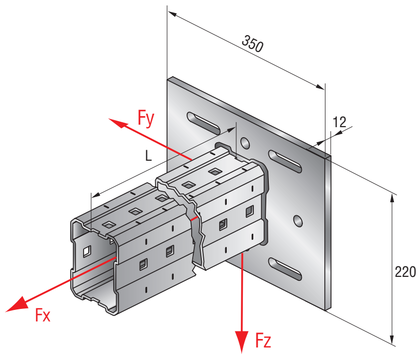
Loading:	± Fyrec [kN]	± Fxrec [kN]	± Fzrec [kN]	± Myrec [kNm]	± Mxrec [kNm]	± Mzrec [kNm]
Fx		20.70				
Fy // Fz*	6.00		6.00			
Fy + Fz	4.24		4.24			
My			4.40	1.70		
Mz	4.40					1.20
FxMz	4.40	7.00				1.40
FxMy		6.90	4.40	1.10		
Mx			2.10		0.53	
Mx	2.10				0.53	
LF1a	2.00	6.20	2.00	0.70	0.21	0.70
LF1b	2.00	6.20	2.00	0.70	0.21	0.70
LF2a		15.00	1.13		0.47	
LF2b	1.13	15.00			0.47	
LF3 oST	0.66		4.40	1.30		0.20
LF3 ST	1.49	7.00	4.14			1.10
LF4	3.11	20.70	3.11			

Fastened with four MI-GC-M12 beam clamps (see individual parts).

Loading permissible in only one direction (// = or).

MIC-S120-B-500 -750 -1000 -1500 -2000



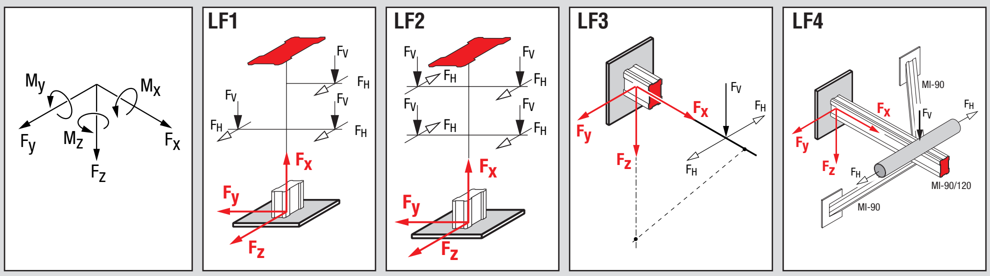


Loading:	± Fyrec [kN]	± Fxrec [kN]	± Fzrec [kN]	± Myrec [kNm]	± Mxrec [kNm]	± Mzrec [kNm]
Fx		13.00				
Fy // Fz*	6.00		6.00			
Fy + Fz	4.24		4.24			
My			4.40	1.40		
Mz	4.40					1.20
FxMz	4.00	5.70				1.00
FxMy		5.10	4.00	0.90		
Mx			2.10		0.53	
Mx	2.10				0.53	
LF1a	2.00	5.00	2.00	0.60	0.21	0.60
LF1b	2.00	5.00	2.00	0.60	0.21	0.60
LF2a		13.00	1.13		0.47	
LF2b	1.13	13.00			0.47	
LF3 oST	0.66		4.40	1.30		0.20
LF3 ST	1.49	7.00	4.14			0.80
LF4	3.11	13.00	3.11			

Fastened with four MI-GC-M12 beam clamps (see individual parts).

Loading permissible in only one direction (// = or).

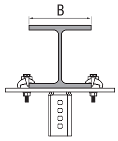
Moments and loading configurations

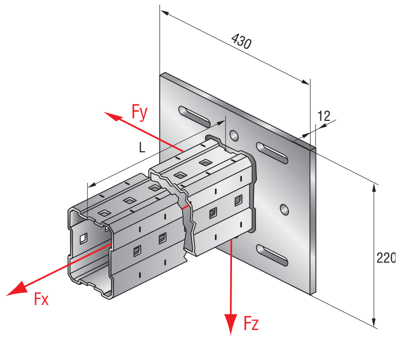


F_V = vertical load
F_H = horizontal load
LF = loading configuration
LF1a/b = different loads, see tables
LF2a = Moment M_X induced by F_Z
LF2b = Moment M_X induced by F_y
LF3ST = cantilever with support
LF3oST = cantilever without support

MIC-S120-C-xxx welded bracket - connector on steel beam (rec. loads)

MIC-S120-C-500
-750
-1000
-1500
-2000

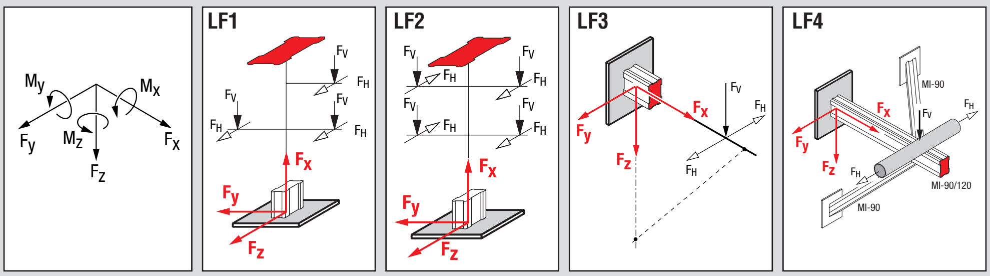




Loading:	± Fy_{rec} [kN]	± Fx_{rec} [kN]	± Fz_{rec} [kN]	± My_{rec} [kNm]	± Mx_{rec} [kNm]	± Mz_{rec} [kNm]
Fx		9.10				
Fy // Fz*	6.00		6.00			
Fy + Fz	4.24		4.24			
My			4.40	1.10		
Mz	4.40					1.20
FxMz	4.00	5.00				0.70
FxMy		4.70	4.00	0.60		
Mx			2.10		0.53	
Mx	2.10				0.53	
LF1a	2.00	3.80	2.00	0.50	0.21	0.50
LF1b	2.00	3.80	2.00	0.50	0.21	0.50
LF2a		9.10	1.13		0.47	
LF2b	1.13	9.10			0.47	
LF3 oST	0.66		4.40	1.00		0.15
LF3 ST	1.49	5.00	4.14			0.70
LF4	3.11	9.10	3.11			

Fastened with four MI-GC-M12 beam clamps (see individual parts).
Loading permissible in only one direction (// = or).

Moments and loading configurations



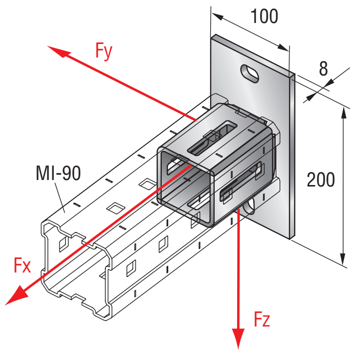
F_V = vertical load
F_H = horizontal load

LF = loading configuration

LF1a/b = different loads, see tables
LF2a = Moment M_x induced by F_z
LF2b = Moment M_x induced by F_y
LF3ST = cantilever with support
LF3oST = cantilever without support

MIC-C90-U / AA connector on concrete (rec. loads)

MIC-C90-U crossbeam connector



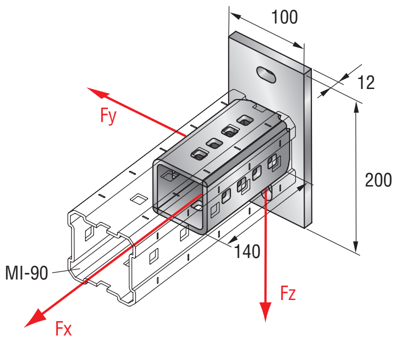
Loading:	± Fy_{rec} [kN]	± Fx_{rec} [kN]	± Fz_{rec} [kN]
Fx	–	–	–
Fy // Fz*	5.82	–	13.20
Fy + Fz	5.82	–	11.67

When Fy –> elongated hole in Fy-direction with injection nut and filled with Hilti HIT HY 150 (dynamic set).

Fastened to concrete by way of approved Hilti HST (R) M12 anchor; alternative approved Hilti anchors are the HDA, HVZ, HIT-TZ of the same nominal diameter and same version.

Loading permissible in only one direction (// = or).

MIC-C90-AA cantilever connector



Loading:	± Fy_{rec} [kN]	± Fx_{rec} [kN]	± Fz_{rec} [kN]	± My_{rec} [kNm]	± Mx_{rec} [kNm]	± Mz_{rec} [kNm]
Fx		8.80				
Fy // Fz*	8.73		13.20			
Fy + Fz	8.73		11.67			
My			2.50	0.67 **(0.88)**		
FxMy		3.60	2.00	0.40		
LF1	1.60	3.60	1.60	0.40		
LF3		7.00	5.00			

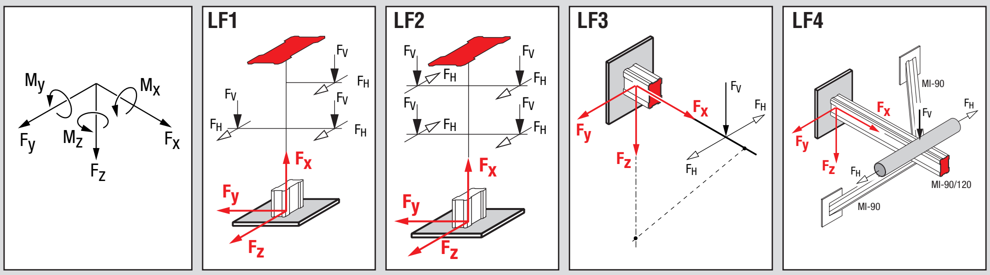
When Fy –> elongated hole in Fy-direction with injection nut and filled with Hilti HIT HY 150 (dynamic set).

Values in brackets ( ) apply to use of three bolts in square sections, two inserted in the direction of the horizontal force and one at 90° (also see MI applications).
Note: The third bolt (MIA-OH-90 304889) must be ordered additionally.

Fastened to concrete by way of approved Hilti HST (R) M12 anchor; alternative approved Hilti anchors are the HDA, HVZ, HIT-TZ of the same nominal diameter and same version.

Loading permissible in only one direction (// = or).

Moments and loading configurations



F_V = vertical load
F_H = horizontal load

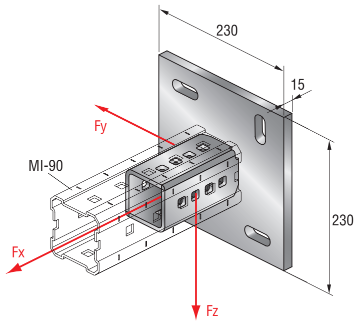
LF = loading configuration

LF1a/b = different loads, see tables
LF2a = Moment M_x induced by F_z
LF3ST = cantilever with support

LF2b = Moment M_x induced by F_y
LF3oST = cantilever without support

MIC-C90 / 120-D connector on concrete (rec. loads)

MIC-C90-D



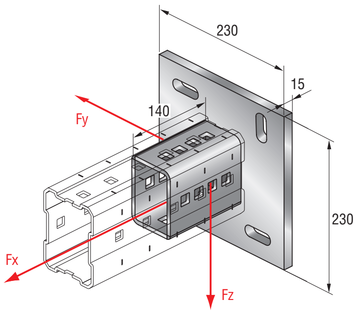
Loading:	± Fy$_{rec}$ [kN]	± Fx$_{rec}$ [kN]	± Fz$_{rec}$ [kN]	± My$_{rec}$ [kNm]	± Mx$_{rec}$ [kNm]	± Mz$_{rec}$ [kNm]
Fx		22.00				
Fy // Fz*	28.10		28.10			
Fy + Fz	28.10		28.10			
My			7.20	0.67 **(0.88)**		
Mz	7.20					0.67
FxMz	4.40	7.00				0.67
FxMy		7.00	4.40	0.67 **(0.88)**		
Mx			13.30		1.82 **(2.74)**	
Mx	13.30				1.82 **(2.74)**	
LF1a	2.70	7.40	2.70	0.67	0.21	0.67
LF2a		8.70	2.00		0.50	
LF2b	2.00	8.70			0.50	
LF3 oST	2.00		7.00	0.67 **(0.88)**		0.23
LF3 ST	2.50	7.00	7.00			0.67
LF4	15.00	12.00	15.00			

Values in brackets ( ) apply to use of three bolts in square sections, two inserted in the direction of the horizontal force and one at 90° (also see MI applications). Note: The third bolt (MIA-OH-90 304889) must be ordered additionally.

Fastened to concrete by way of approved Hilti HST (R) M16 anchor; alternative approved Hilti anchors are the HDA, HVZ, HIT-TZ of the same nominal diameter and same version.

*Loading permissible in only one direction (// = or).

MIC-C120-D



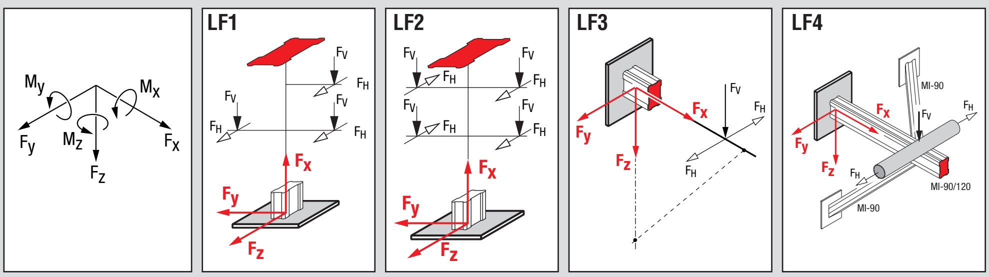
Loading:	± Fy$_{rec}$ [kN]	± Fx$_{rec}$ [kN]	± Fz$_{rec}$ [kN]	± My$_{rec}$ [kNm]	± Mx$_{rec}$ [kNm]	± Mz$_{rec}$ [kNm]
Fx		22.00				
Fy // Fz*	28.10		28.10			
Fy + Fz	28.10		28.10			
My			8.40	0.93 **(1.28)**		
Mz	8.00					0.67
FxMz	4.40	8.90				0.67
FxMy		8.90	4.40	0.93 **(1.10)**		
Mx			13.30		2.48 **(3.52)**	
Mx	13.30				2.48 **(3.52)**	
LF1a	2.70	9.50	2.70	0.93	0.21	0.67
LF2a		9.70	2.00		0.50	
LF2b	2.00	9.70			0.50	
LF3 oST	2.00		7.00	0.93 **(1.28)**		0.24
LF3 ST	2.50	7.00	7.00			0.67
LF4	15.00	12.00	15.00			

Values in brackets ( ) apply to use of three bolts in square sections, two inserted in the direction of the horizontal force and one at 90° (also see MI applications).

Note: The third bolt (MIA-OH-120 304890) must be ordered additionally.
Fastened to concrete by way of approved Hilti HST (R) M16 anchor; alternative approved Hilti anchors are the HDA, HVZ, HIT-TZ of the same nominal diameter and same version.

*Loading permissible in only one direction (// = or).

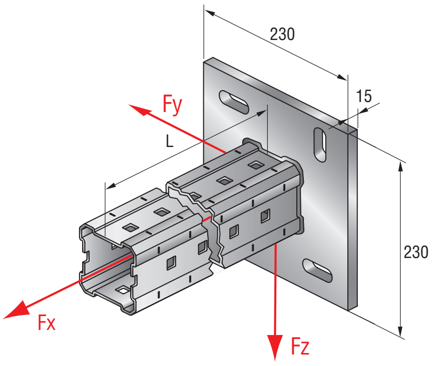
Moments and loading configurations



F_V = vertical load
F_H = horizontal load
LF = loading configuration
LF1a/b = different loads, see tables
LF2a = Moment M_X induced by F_Z
LF2b = Moment M_X induced by F_y
LF3ST = cantilever with support
LF3oST = cantilever without support

MIC-C90 / 120-D-xxx welded bracket – connector on concrete (rec. loads)

MIC-C90-D-500
-750
-1000
-1500
-2000

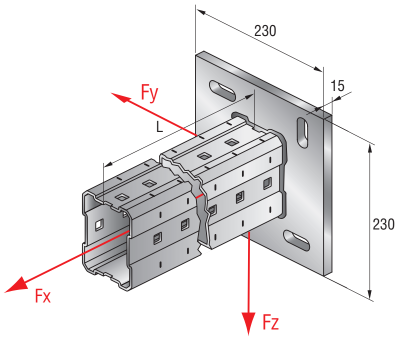


Loading:	± Fyrec [kN]	± Fxrec [kN]	± Fzrec [kN]	± Myrec [kNm]	± Mxrec [kNm]	± Mzrec [kNm]
Fx		25.50				
Fy // Fz*	30.00		30.00			
Fy + Fz	30.00		30.00			
My			8.80	2.20		
Mz	8.80					2.20
FxMz	5.60	8.22				1.23
FxMy		8.22	5.60	1.23		
Mx			16.00		4.00	
Mx	16.00				4.00	
LF1a	3.60	8.80	3.60	0.80	0.21	0.80
LF2a		13.50	2.00		0.50	
LF2b	2.00	13.50			0.50	
LF3 oST	2.00		7.00	1.70		0.26
LF3 ST	2.50	7.00	7.00			1.60
LF4	18.00	18.00	18.00			

Fastened to concrete by way of approved Hilti HST (R) M16 anchor; alternative approved Hilti anchors are the HDA, HVZ, HIT-TZ of the same nominal diameter and same version.

*Loading permissible in only one direction (// = or).

MIC-C120-D-500
-750
-1000
-1500
-2000

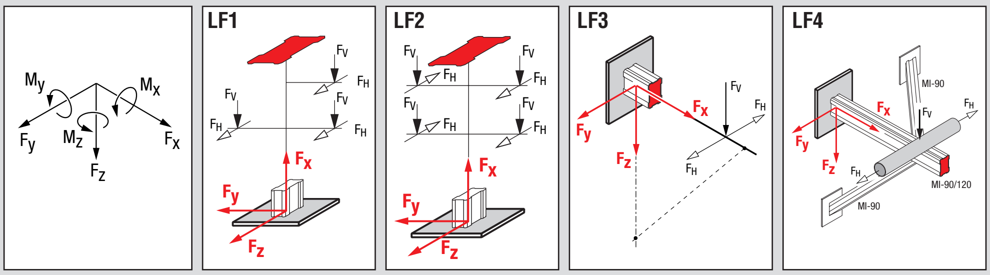


Loading:	± Fyrec [kN]	± Fxrec [kN]	± Fzrec [kN]	± Myrec [kNm]	± Mxrec [kNm]	± Mzrec [kNm]
Fx		25.50				
Fy // Fz*	28.10		33.00			
Fy + Fz	28.10		33.00			
My			10.00	2.50		
Mz	10.00					2.50
FxMz	5.60	12.33				1.85
FxMy		12.33	5.60	1.85		
Mx			16.00		4.40	
Mx	16.00				4.40	
LF1a	4.00	10.00	4.00	1.00	0.25	1.00
LF2a		13.50	2.00		0.50	
LF2b	2.00	13.50			0.50	
LF3 oST	2.00		8.00	2.00		0.30
LF3 ST	2.50	7.00	7.00			2.00
LF4	18.00	18.00	18.00			

Fastened to concrete by way of approved Hilti HST (R) M16 anchor; alternative approved Hilti anchors are the HDA, HVZ, HIT-TZ of the same nominal diameter and same version.

*Loading permissible in only one direction (// = or).

Moments and loading configurations



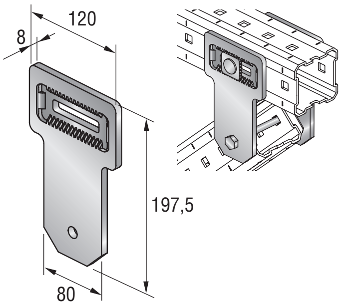
F_V = vertical load
F_H = horizontal load

LF = loading configuration

LF1a/b = different loads, see tables
LF2a = Moment M_X induced by F_Z
LF3ST = cantilever with support
LF2b = Moment M_X induced by F_y
LF3oST = cantilever without support

MIC-U-MA angle connector on girder

MIC-U-MA on MI-90 / MI-120

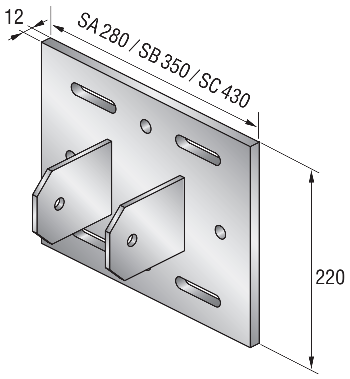


	Tensile and compressive loads: **MIC-U-MA girder connector** F [kN]
0°	24.0
30°	11.8
45°	10.0
60°	9.2
90°	9.7
45° only pression	10.0

Always to be used in pairs.

MIC-SA / SB / SC-MA angle connector on steel (rec. loads)

MIC-SA-MA / MIC-SB-MA / MIC-SC-MA for MI-90 / MI-120

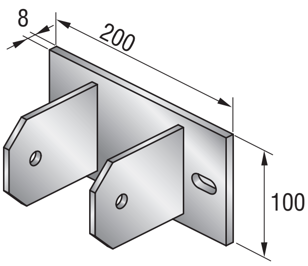


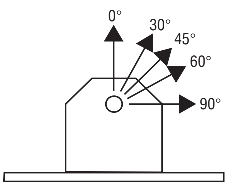
	Tensile and compressive loads: **MIC-SA-MA steel connector** F [kN]	Tensile and compressive loads: **MIC-SB-MA steel connector** F [kN]	Tensile and compressive loads: **MIC-SC-MA steel connector** F [kN]
0°	16.0	12.0	8.0
30°	10.0	10.0	8.0
45°	7.0	7.0	7.0
60°	6.0	6.0	6.0
90°	5.0	5.0	5.0
45° only pression	8.5	8.5	8.5

The recommended load is limited by fastening to the steel beam with four MI-GC-M12 beam clamps (see individual parts).

MIC-CU-MA angle connector on concrete (rec. loads)

MIC-CU-MA for MI-90 / MI-120





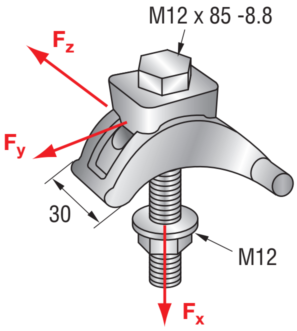
	Tensile and compressive loads: **MIC-CU-MA on concrete with M12 anchor** F [kN]
0°	7.1
30°	5.0
45°	5.0 (HST 4.0)
60°	5.0 (HST 4.0)
90°	6.0 (HST 5.3)
45° only pression	10.0

Fastened to concrete by way of:

Approved Hilti HST (R) M12 anchor; alternative approved Hilti anchors are the HDA, HVZ, HIT-TZ of the same nominal diameter and same version.

MI-SGC-M12 beam clamp (rec. loads)

MI-SGC-M12



MI-SGC-M12 beam clamp

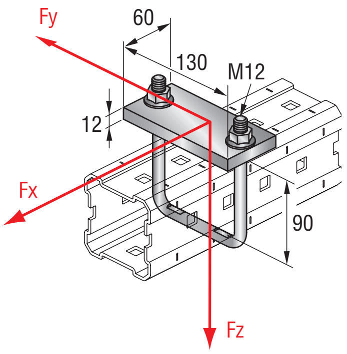
Loading:	± Fy [kN]	± Fx [kN]	± Fz [kN]
rec Fx		5.80	
rec Fy // Fz*	1.50		1.50
rec Fy + Fz	1.06		1.06
rec Fy + Fx	1.10	5.80	
rec Fz + Fx		5.80	1.10
Fx+Fy+Fz	0.78	5.80	0.78

All loads apply to 1 beam clamp.
Beam clamps must always be used in pairs.
Not suitable for dynamic loading!

* Only one loading direction permissible (// = or).

MIC-SPH-90 / 120 plate for weld-on tabs (rec. loads)

MIC-SPH-90
for MI-90

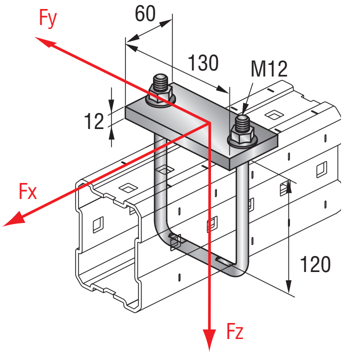


Loading:	± Fy [kN]	± Fx [kN]	± Fz [kN]
rec Fy // Fx // Fz*	6	5	5

* Only one loading direction permissible (// = or).

The steel U-bolt must not be used for fastening pipes (risk of pinching the pipe).

MIC-SPH-120
for MI-120



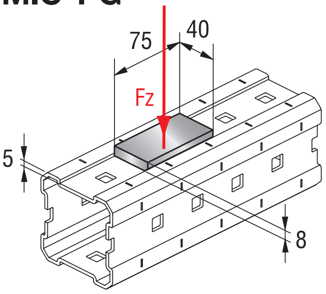
Loading:	± Fy [kN]	± Fx [kN]	± Fz [kN]
rec Fy // Fx // Fz*	6	5	5

* Only one loading direction permissible (// = or).

The steel U-bolt must not be used for fastening pipes (risk of pinching the pipe).

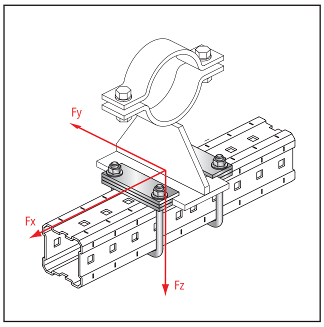
MIC-PG low friction insert

MIC-PG



Loading:	± Fy [kN]	± Fx [kN]	+ Fz [kN]
rec Fz			30

MIC-PS90 / 120 sliding support clamps (rec. loads)



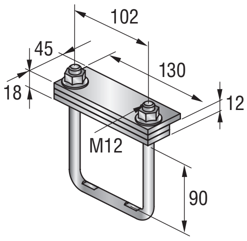
Loading:	± Fx [kN]	– Fz [kN]	+ Fz [kN]
rec Fy // Fx // Fz*	4.2	6	30

Values apply only to connecting parts. Must be used in pairs. Tightening torque = 60 Nm.

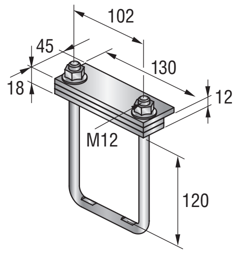
*Only one loading direction permissible (// = or).

The steel U-bolt must not be used for fastening pipes (risk of pinching the pipe).

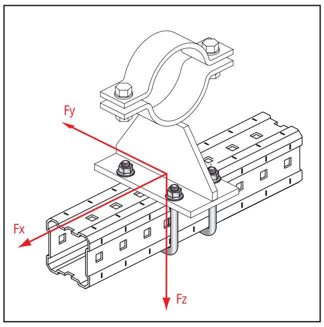
MIC-PS90
for MI-90



MIC-PS120
for MI-120



MIA-B090 / 120-M12 fixed point clamps (rec. loads)



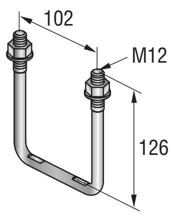
Lastfälle:	± Fy [kN]	± Fx [kN]	– Fz [kN]	+ Fz [kN]
rec Fy // Fx // Fz*	12	10	10	30

Values apply only to connecting parts. Must be used in pairs.

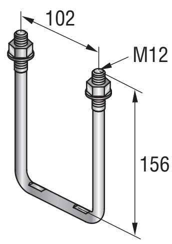
*Only one loading direction permissible (// = or).

The steel U-bolt must not be used for fastening pipes (risk of pinching the pipe).

MIA-B090-M12
for MI-90

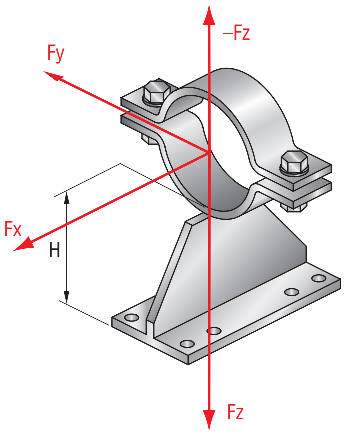


MIA-B120-M12
for MI-120



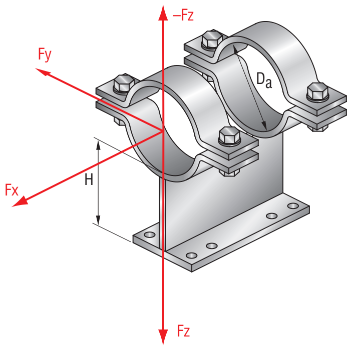
MI-PS1/1, MI-PS2/1, MI-PS2/2 pipe supports (max. loads*)

MI-PS1/1



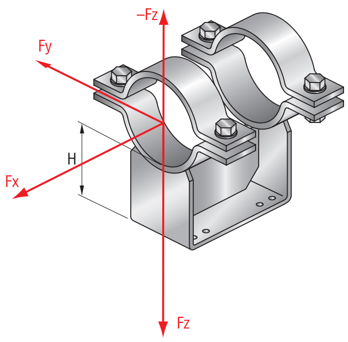
DN	Pipe outside dia. [mm]	H	Ordering designation	±Fy [kN]	±Fx [kN]	+Fz [kN]	–Fz [kN]
25	33.7	85	MI-PS1/1 25–85	0.3	0.4	0.8	0.3
25	33.7	140	MI-PS1/1 25–140	0.3	0.4	0.8	0.3
40	48.3	85	MI-PS1/1 40–85	0.3	0.5	1.0	0.3
40	48.3	140	MI-PS1/1 40–140	0.3	0.5	1.0	0.3
50	60.3	85	MI-PS1/1 50–85	0.6	0.9	1.8	0.6
50	60.3	140	MI-PS1/1 50–140	0.6	0.9	1.8	0.6
65	76.1	85	MI-PS1/1 65–85	0.7	1.1	2.1	0.7
65	76.1	140	MI-PS1/1 65–140	0.7	1.1	2.1	0.7
80	88.9	85	MI-PS1/1 80–85	0.8	1.2	2.3	0.8
80	88.9	140	MI-PS1/1 80–140	0.8	1.2	2.3	0.8
100	114.3	85	MI-PS1/1 100–85	1.7	2.5	5.0	1.7
100	114.3	140	MI-PS1/1 100–140	1.7	2.5	5.0	1.7
125	139.7	85	MI-PS1/1 125–85	1.9	2.9	5.8	1.9
125	139.7	140	MI-PS1/1 125–140	1.9	2.9	5.8	1.9
150	168.3	85	MI-PS1/1 150–85	2.1	3.2	6.4	2.1
150	168.3	140	MI-PS1/1 150–140	2.1	3.2	6.4	2.1

MI-PS2/1



DN	Pipe outside dia. [mm]	H	Ordering designation	±Fy [kN]	±Fx [kN]	+Fz [kN]	–Fz [kN]
25	33.7	85	MI-PS2/1 25–85	0.5	0.8	1.5	0.5
25	33.7	140	MI-PS2/1 25–140	0.5	0.8	1.5	0.5
40	48.3	85	MI-PS2/1 40–85	0.7	1.0	2.0	0.7
40	48.3	140	MI-PS2/1 40–140	0.7	1.0	2.0	0.7
50	60.3	85	MI-PS2/1 50–85	1.2	1.8	3.5	1.2
50	60.3	140	MI-PS2/1 50–140	1.2	1.8	3.5	1.2
65	76.1	85	MI-PS2/1 65–85	1.4	2.1	4.2	1.4
65	76.1	140	MI-PS2/1 65–140	1.4	2.1	4.2	1.4
80	88.9	85	MI-PS2/1 80–85	1.6	2.4	4.7	1.6
80	88.9	140	MI-PS2/1 80–140	1.6	2.4	4.7	1.6
100	114.3	85	MI-PS2/1 100–85	2.0	3.0	6.0	2.0
100	114.3	140	MI-PS2/1 100–140	2.0	3.0	6.0	2.0
125	139.7	85	MI-PS2/1 125–85	2.3	3.5	7.0	2.3
125	139.7	140	MI-PS2/1 125–140	2.3	3.5	7.0	2.3
150	168.3	85	MI-PS2/1 150–85	2.7	4.0	8.0	2.7
150	168.3	140	MI-PS2/1 150–140	2.7	4.0	8.0	2.7
200	219.1	107	MI-PS2/1 200–107	3.2	4.8	9.5	3.2
200	219.1	142	MI-PS2/1 200–142	3.2	4.8	9.5	3.2
250	273.0	107	MI-PS2/1 250–107	3.5	5.3	10.5	3.5
250	273.0	142	MI-PS2/1 250–142	3.5	5.3	10.5	3.5
300	323.9	107	MI-PS2/1 300–107	3.8	5.8	11.5	3.8
300	323.9	142	MI-PS2/1 300–142	3.8	5.8	11.5	3.8

MI-PS2/2



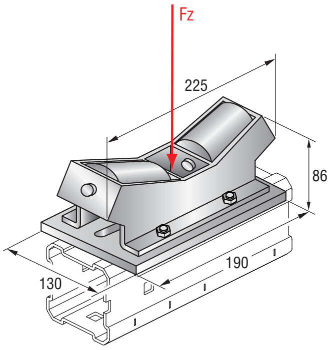
DN	Pipe outside dia. [mm]	H	Ordering designation	±Fy [kN]	±Fx [kN]	+Fz [kN]	–Fz [kN]
200	219.1	107	MI-PS2/2 200–107	4.0	–	12.0	4.0
200	219.1	142	MI-PS2/2 200–142	4.0	–	12.0	4.0
250	273.0	107	MI-PS2/2 250–107	5.0	–	15.0	5.0
250	273.0	142	MI-PS2/2 250–142	5.0	–	15.0	5.0
300	323.9	107	MI-PS2/2 300–107	5.3	–	16.0	5.3
300	323.9	142	MI-PS2/2 300–142	5.3	–	16.0	5.3
350	355.6	142	MI-PS2/2 350–142	5.9	–	17.8	5.9
350	355.6	192	MI-PS2/2 350–192	5.9	–	17.8	5.9
400	406.4	142	MI-PS2/2 400–142	6.0	–	18.7	6.0
400	406.4	192	MI-PS2/2 400–192	6.0	–	18.7	6.0
500	508.0	142	MI-PS2/2 500–142	6.0	–	21.3	6.0
500	508.0	192	MI-PS2/2 500–192	6.0	–	21.3	6.0
600	610.0	142	MI-PS2/2 600–142	6.0	–	28.0	6.0
600	610.0	192	MI-PS2/2 600–192	6.0	–	28.0	6.0

* When using the pipe supports, consideration must be given to the max. loading capacity of connecting parts.

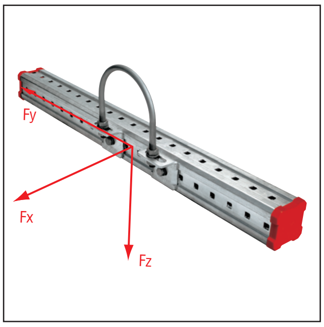
MI-DPR roller support (rec. loads)

MI-DPR for MI-90 / MI-120

Pipe center	Pipe outside dia. [mm]	Fz_{rec} [kN]
200–400	219–406	15



MIC-UB90 U-bolt clamps for uninsulated pipes

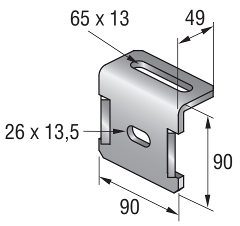


Loading:	± Fy rec [kN]	– Fz rec [kN]
Fy // Fz*	0.5	1.0

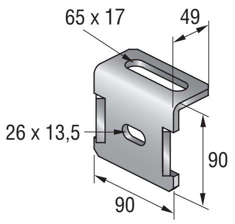
Use in pairs.

* Only one loading direction permissible (// = or).

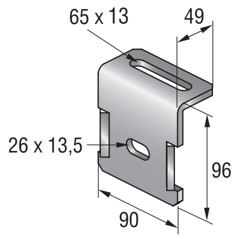
MIC-UB90-M12 for MI-90



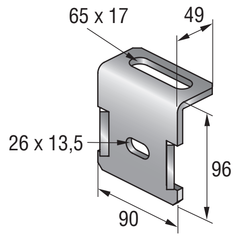
MIC-UB90-M16 for MI-90



MIC-UB120-M12 for MI-120



MIC-UB120-M16 for MI-120

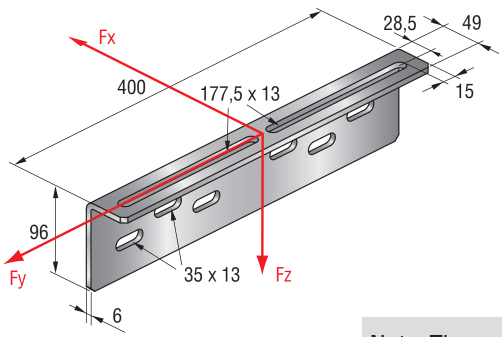


MIC-UB90 L400 for MI-90/120

Loading:	± Fy rec [kN]	– Fz rec [kN]
Fy // Fz*	0.15	0.15*/0.3**

(For fastening several pipes) *single **per elongated hole

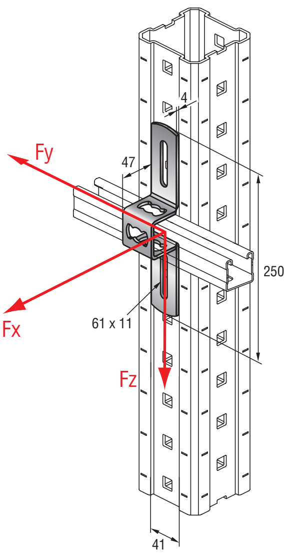
** Only one loading direction permissible (// = or).



Note: The corresponding MI-UB ..... U-bolts may be used only for fastening pipes.

MQ connectors for MI girders

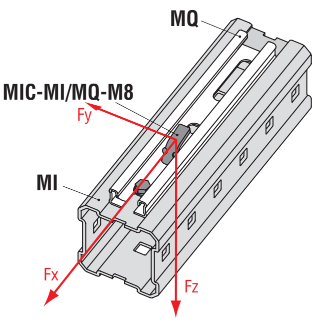
MIC-MI / MQ-X

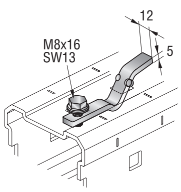


	Loading:	± Fy rec [kN]	± Fx rec [kN]	± Fz rec [kN]
MQ-21-F	Fy // Fx // Fz*	5	2.5	1.2
MQ-41-F	Fy // Fx // Fz*	5	2.5	1.2
MQ-41D-F	Fy // Fx // Fz*	5	2.5	1.2
MQ-52-72D-F	Fy // Fx // Fz*	8	2.5	1.2

*Only one loading direction permissible (// = or).

MIC-MI / MQ-M8





Loading:	MQ channel gauge [mm]	± Fy rec [kN]	± Fx rec [kN]	± Fz rec [kN]
Fy // Fx // Fz*	2.00	6	6.85	4 (8)**
Fy // Fx // Fz*	2.50	6	8.56	4 (8)**
Fy // Fx // Fz*	2.75	6	9.42	4 (8)**
Fy // Fx // Fz*	3.00	6	10.28	4 (8)**
Fy // Fx // Fz*	3.00	6	12.00	4 (8)**
Fy // Fx // Fz*	3.00	6	13.70	4 (8)**

**Use in pairs.
Values apply only to MQ part connected.
Bolt tightening torque = 24 Nm

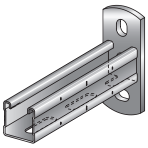
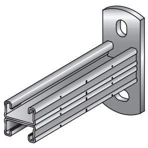
*Only one loading direction permissible (// = or).

MQ system applications

All load values for the individual parts listed below are recommended loads.
Loads taken up by the applicable base material must be verified separately.
The design value = recommended load × factor 1.4

Applications

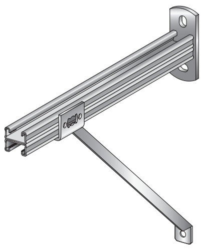
Cantilevers without support

MQK-21/450-F
MQK-41/300-F
MQK-41/450-F
MQK-41/600-F
MQK-21D/450-F

5.93

Cantilevers with support



MQK-21/450-F
MQK-41/300-F
MQK-41/450-F
MQK-41/600-F
MQK-21D/450-F

5.93

Cantilevers without support

Cantilever	Channel L (cm)	Loading condition 1 Uniformly distributed F1 = q · l F1 [kN]		Loading condition 2 Single load F1 [kN]		Loading condition 3 F1 [kN]		Loading condition 4 F2 [kN]		Loading condition 5 F3 [kN]	
		HVZ-R M12 1)	HST-R M12 2)	HVZ-R M12 1)	HST-R M12 2)	HVZ-R M12 1)	HST-R M12 2)	HVZ-R M12 1)	HST-R M12 2)	HVZ-R M12 1)	HST-R M12 2)
MQK-21/450-F	45	0.500	0.500	0.560	0.560	0.180	0.180	0.280	0.280	0.180	0.180
MQK-41/300-F	30	2.560	2.560	2.560	2.560	1.280	1.280	1.280	1.280	0.850	0.850
MQK-41/450-F	45	1.710	1.710	1.710	1.710	0.850	0.850	0.850	0.850	0.570	0.570
MQK-41/600-F	60	1.270	1.270	1.270	1.270	0.620	0.620	0.630	0.630	0.420	0.420
MQK-21 D/450-F	45	1.620	1.620	1.620	1.620	0.810	0.810	0.810	0.810	0.540	0.540

1) Loading capacity of the cantilever (loading capacity of steel) or fastening with approved Hilti HVZ-R M12 anchors / the loading capacity of the cantilever is achieved when HVZ-R M12 anchors are used.

2) Loading capacity of the cantilever with approved Hilti HST-R anchors / alternative approved Hilt anchor HIT-RTZ M12, load values at least as high as with HST-R M12.
Load values apply to concrete of at least the C20 / 25 grade.
Alternative means of fastening in solid or hollow brick with Hilti HIT HY-50, approval possible; use stainless steel anchor rods (load values not given in this table).
The weight of the cantilever itself is taken into account.
The load values apply only to fastenings made well away from edges (special calculations required for fastenings made at edges).
Loads taken up by the base material (steel, concrete) must be verified separately.
The anchor approval application guidelines must be observed. Load values are according to approval status May 2004.
Deformation of l/150 is adhered to in all cases, measured at the outermost point of load action.

Cantilevers with support

Cantilever	L (cm)	Support	Loading condition 1 Uniformly distributed F1 = q · l F1 [kN] 1)	Loading condition 2 Single load F1 [kN] 1)	Loading condition 3 F1 [kN] 1)	Loading condition 4 F2 [kN] 1)	Loading condition 5 F3 [kN] 1)
MQK-21/450 -F	45	short	4.420	1.140	0.520	1.970	1.750
MQK-41/300 -F	30	short	10.370	5.170	5.750	4.050	2.760
MQK-41/450-F	45	short	7.670	3.450	2.390	3.830	2.550
MQK-41/600-F	60	short	5.540	2.580	2.840	2.510	1.890
MQK-21 D/450-F	45	long	7.660	3.280	2.270	3.830	2.550

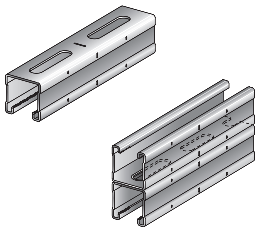
1) Loading capacity of the cantilever (loading capacity of steel) or fastening with approved Hilti HVZ-R M12 anchors / the loading capacity of the cantilever is achieved when HVZ-R M12 anchors are used.
Load values apply to concrete of at least the C20 / 25 grade.
Alternative means of fastening in solid or hollow brick with Hilti HIT HY-50, approval possible; use stainless steel anchor rods (load values not given in this table).
The weight of the cantilever itself is taken into account.
The load values apply only to fastenings made well away from edges (special calculations required for fastenings made at edges).
Loads taken up by the base material (steel, concrete) must be verified separately.
The anchor approval application guidelines must be observed. Load values are according to approval status May 2004.
Deformation of l/150 is adhered to in all cases, measured at the outermost point of load action.

MQ System individual parts

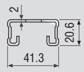
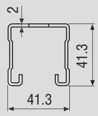
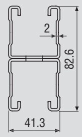
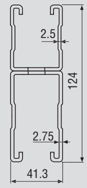
All load values given for the parts below are recommended loads.
Loads taken up by the base material must be verified separately.
The design value = recommended load × factor 1.5; except MQ-channel factor 1.4

MQ channels

MQ-21-F / MQ-41-F / MQ-41-D-F / MQ-52-72D-F



Values for MQ cross sections incl. torsion

Technical data		Channel cross sections			
					
		MQ-21-F	**MQ-41-F**	**MQ-41 D-F**	**MQ-52-72 D-F**
Material thickness	t [mm]	2.0	2.0	2.0	2.5/2.75
Cross sectional area	A [mm^2]	165.3	245.1	490.3	844.9
Weight of channel	[kg/m]	1.48	2.13	4.29	7.26
Lengths available	[m]	3/6	3/6	3/6	6
Material					
Yield strength	$f_{y,k}$ [N/mm^2]	235.0	235.0	235.0	235.0
Permissible tensile stress	σ_{rec} [N/mm^2]	152.6	152.6	152.6	152.6
Permissible shear stress	τ_{rec} [N/mm^2]	88.1	88.1	88.1	88.1
Modulus of elasticity	[N/mm^2]	210000	210000	210000	210000
Shear modulus	[N/mm^2]	81000	81000	81000	81000
Surface					
Hot-dip galvanized		45 µm	45 µm	45 µm	45 µm
Cross section values **y-axis**					
Axis of gravity “open” [1]	e_1 [mm]	10.84	21.13	41.30	62.02
Axis of gravity	e_2 [mm]	9.76	20.17	41.30	61.99
Moment of inertia	I_y [cm^4]	0.92	5.37	30.69	115.41
Section modulus “open”	W_{y1} [cm^3]	0.85	2.54	7.43	18.61
Section modulus	W_{y2} [cm^3]	0.94	2.66	7.43	18.62
Radius of gyration	i_y [cm]	0.74	1.48	2.50	3.70
Permissible moment [2]	M_y [Nm]	129.1	388.1	1133.9	2839.8
z-axis					
Moment of inertia	I_z [cm^4]	4.39	7.33	14.67	26.13
Section modulus	W_z [cm^3]	2.13	3.55	7.10	12.65
Radius of gyration	i_z [cm]	1.63	1.73	1.73	1.76

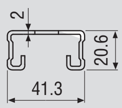
[1] For calculation of bending loads, the smaller value (W_{y1}, W_{y2}) is applicable ($W_{y1} = I_y / e_1$ bzw. $W_{y2} = I_y / e_2$).

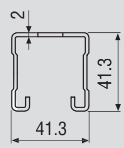
[2] Per. $M_y = \sigma_{rec} * \min(W_{y1}, W_{y2})$

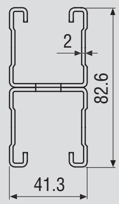
Recommended buckling loads for MQ channels

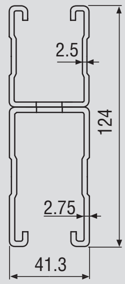
Buckling stress line "b" as per DIN 18800 part 2

Buckling loads

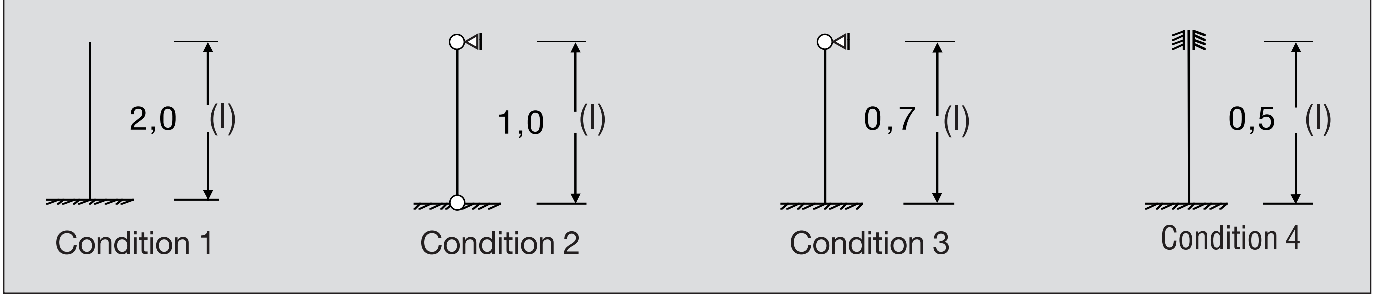








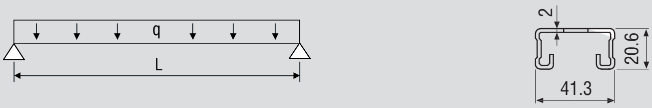
Effective length [cm]	MQ-21-F [kN]	MQ-41-F [kN]	MQ-41-D-F [kN]	MQ-52-72 D-F [kN]
25	23.60	37.16	74.34	128.10
50	19.36	35.00	71.46	123.38
75	13.73	32.19	66.96	115.82
100	9.16	28.71	61.64	106.90
125	6.33	24.59	55.24	96.20
150	4.58	20.35	48.04	84.08
175	3.45	16.62	40.81	71.77
200		13.59	34.31	60.55
225		11.22	28.85	51.05
250		9.38	24.41	43.25
275		7.93	20.82	36.94
300		6.79	17.92	31.83
325		5.87	15.57	27.65
350		5.12	13.63	24.22
375			12.02	21.38
400			10.68	19.00



Single-span: tables for MQ-21-F channel

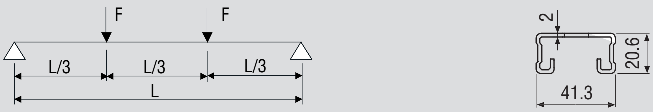
F_1 at f = L/200, F_2 at f = L/300, F at $\sigma_{per.}$ incl. own weight of channel

Single span with bending load in 1 axis uniformly distributed load



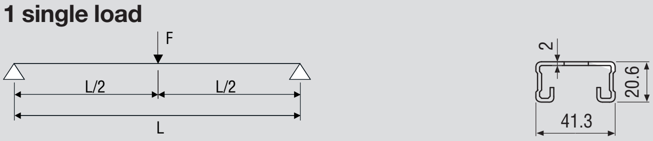
Span length [cm]	q [kN/m]	F [kN]	f [mm] ≤ σzul.	F1 [kN]	f [mm] ≤ σzul.	F2 [kN]	f [mm] ≤ σzul.
25	16.52	4.13	0.4	–	–	–	–
50	4.12	2.06	1.7	–	–	1.97	1.7
75	1.82	1.37	3.9	1.30	3.8	0.87	2.5
100	1.02	1.02	7.0	0.73	5.0	0.48	3.3
125	0.65	0.81	10.9	0.46	6.3	0.30	4.2
150	0.44	0.67	15.7	0.31	7.5	0.20	5.0
175	0.32	0.57	21.4	0.22	8.8	0.14	5.8
200	0.24	0.49	27.9	0.16	10.0	0.09	6.7
225	0.19	0.43	35.4	0.11	11.3	0.07	7.5
250	0.15	0.38	43.6	0.08	12.5	0.04	8.3
275	0.12	0.34	52.8	0.06	13.8	0.03	9.2
300	0.10	0.30	62.8	0.04	15.0	0.01	10.0
325	0.08	0.27	73.8	0.02	16.3	–	–
350	0.07	0.24	85.5	0.01	17.5	–	–
375	0.06	0.22	98.2	–	–	–	–
400	–	–	–	–	–	–	–
425	–	–	–	–	–	–	–
450	–	–	–	–	–	–	–
475	–	–	–	–	–	–	–
500	–	–	–	–	–	–	–
525	–	–	–	–	–	–	–
550	–	–	–	–	–	–	–
575	–	–	–	–	–	–	–
600	–	–	–	–	–	–	–

Single span with bending load in 1 axis 2 single loads



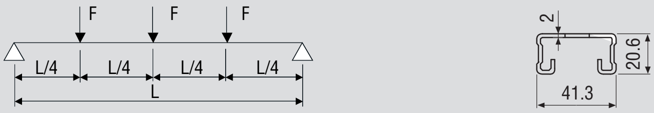
Span length [cm]	F [kN]	f [mm] ≤ σzul.	F1 [kN]	f [mm] ≤ σzul.	F2 [kN]	f [mm] ≤ σzul.
25	1.53	0.4	–	–	–	–
50	0.77	1.8	–	–	0.72	1.7
75	0.51	4.0	0.48	3.8	0.32	2.5
100	0.38	7.1	0.27	5.0	0.18	3.3
125	0.30	11.1	0.17	6.3	0.11	4.2
150	0.25	16.0	0.11	7.5	0.07	5.0
175	0.21	21.8	0.08	8.8	0.05	5.8
200	0.18	28.5	0.06	10.0	0.03	6.7
225	0.16	36.1	0.04	11.3	0.02	7.5
250	0.14	44.5	0.03	12.5	0.02	8.3
275	0.13	53.9	0.02	13.8	–	–
300	0.11	64.1	0.01	15.0	–	–
325	0.10	75.1	–	–	–	–
350	0.09	87.1	–	–	–	–
375	0.08	99.9	–	–	–	–
400	–	–	–	–	–	–
425	–	–	–	–	–	–
450	–	–	–	–	–	–
475	–	–	–	–	–	–
500	–	–	–	–	–	–
525	–	–	–	–	–	–
550	–	–	–	–	–	–
575	–	–	–	–	–	–
600	–	–	–	–	–	–

Single span with bending load in 1 axis 1 single load



Span length [cm]	F [kN]	f [mm] ≤ σzul.	F1 [kN]	f [mm] ≤ σzul.	F2 [kN]	f [mm] ≤ σzul.
25	2.05	0.3	–	–	–	–
50	1.03	1.4	–	–	–	–
75	0.68	3.1	–	–	0.54	2.5
100	0.51	5.6	0.45	5.0	0.30	3.3
125	0.40	8.8	0.28	6.3	0.19	4.2
150	0.33	12.7	0.19	7.5	0.12	5.0
175	0.28	17.3	0.14	8.8	0.08	5.8
200	0.24	22.7	0.10	10.0	0.06	6.7
225	0.21	28.8	0.07	11.3	0.04	7.5
250	0.19	35.7	0.05	12.5	0.03	8.3
275	0.17	43.4	0.04	13.8	0.02	9.2
300	0.15	51.8	0.02	15.0	–	–
325	0.14	61.2	0.01	16.3	–	–
350	0.12	71.3	–	–	–	–
375	0.11	82.4	–	–	–	–
400	0.10	94.4	–	–	–	–
425	–	–	–	–	–	–
450	–	–	–	–	–	–
475	–	–	–	–	–	–
500	–	–	–	–	–	–
525	–	–	–	–	–	–
550	–	–	–	–	–	–
575	–	–	–	–	–	–
600	–	–	–	–	–	–

Single span with bending load in 1 axis 3 single loads

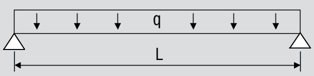


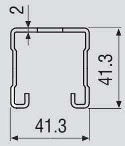
Span length [cm]	F [kN]	f [mm] ≤ σzul.	F1 [kN]	f [mm] ≤ σzul.	F2 [kN]	f [mm] ≤ σzul.
25	1.02	0.4	–	–	–	–
50	0.51	1.7	–	–	–	–
75	0.34	3.7	0.34	3.8	0.23	2.5
100	0.26	6.6	0.19	5.0	0.13	3.3
125	0.21	10.3	0.12	6.3	0.08	4.2
150	0.17	14.9	0.08	7.5	0.06	5.0
175	0.15	20.2	0.06	8.8	0.04	5.8
200	0.13	26.4	0.04	10.0	0.03	6.7
225	0.11	33.3	0.03	11.3	0.02	7.5
250	0.10	41.1	0.02	12.5	0.02	8.3
275	0.09	49.6	0.02	13.8	0.02	9.2
300	0.09	58.9	0.01	15.0	0.01	10.0
325	0.08	69.0	–	–	0.01	10.8
350	0.07	79.9	–	–	–	–
375	0.07	91.5	–	–	–	–
400	–	–	–	–	–	–
425	–	–	–	–	–	–
450	–	–	–	–	–	–
475	–	–	–	–	–	–
500	–	–	–	–	–	–
525	–	–	–	–	–	–
550	–	–	–	–	–	–
575	–	–	–	–	–	–
600	–	–	–	–	–	–

Single-span: tables for MQ-41-F channel

F_1 at f = L/200, F_2 at f = L/300, F at $\sigma_{per.}$ incl. own weight of channel

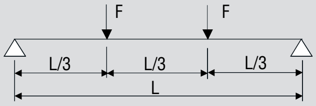
Single span with bending load in 1 axis
uniformly distributed load

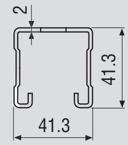




Span length [cm]	q [kN/m]	F [kN]	f [mm] ≤ σzul.	F1 [kN]	f [mm] ≤ σzul.	F2 [kN]	f [mm] ≤ σzul.
25	49.66	12.41	0.2	–	–	–	–
50	12.40	6.20	0.9	–	–	–	–
75	5.50	4.12	2.0	–	–	–	–
100	3.08	3.08	3.6	–	–	2.87	3.3
125	1.97	2.46	5.6	–	–	1.82	4.2
150	1.36	2.04	8.1	1.89	7.5	1.25	5.0
175	0.99	1.74	11.0	1.38	8.8	0.91	5.8
200	0.76	1.51	14.3	1.04	10.0	0.68	6.7
225	0.59	1.33	18.1	0.81	11.3	0.52	7.5
250	0.48	1.19	22.4	0.64	12.5	0.41	8.3
275	0.39	1.07	27.1	0.52	13.8	0.32	9.2
300	0.32	0.97	32.2	0.42	15.0	0.26	10.0
325	0.27	0.89	37.8	0.34	16.3	0.21	10.8
350	0.23	0.81	43.9	0.28	17.5	0.16	11.7
375	0.20	0.75	50.4	0.23	18.8	0.13	12.5
400	0.17	0.69	57.3	0.19	20.0	0.10	13.3
425	0.15	0.64	64.7	0.15	21.3	0.07	14.2
450	0.13	0.60	72.5	0.12	22.5	0.05	15.0
475	0.12	0.55	80.8	0.09	23.8	0.03	15.8
500	0.10	0.52	89.6	0.07	25.0	0.01	16.7
525	0.09	0.48	98.7	0.05	26.3	–	–
550	–	–	–	0.03	27.5	–	–
575	–	–	–	0.01	28.8	–	–
600	–	–	–	–	–	–	–

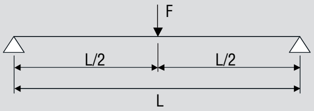
Single span with bending load in 1 axis
2 single loads

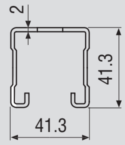




Span length [cm]	F [kN]	f [mm] ≤ σzul.	F1 [kN]	f [mm] ≤ σzul.	F2 [kN]	f [mm] ≤ σzul.
25	4.58	0.2	–	–	–	–
50	2.31	0.9	–	–	–	–
75	1.54	2.1	–	–	–	–
100	1.16	3.7	–	–	1.05	3.3
125	0.92	5.7	–	–	0.67	4.2
150	0.76	8.2	0.70	7.5	0.46	5.0
175	0.65	11.2	0.51	8.8	0.33	5.8
200	0.57	14.6	0.38	10.0	0.25	6.7
225	0.50	18.5	0.30	11.3	0.19	7.5
250	0.45	22.9	0.24	12.5	0.15	8.3
275	0.40	27.7	0.19	13.8	0.12	9.2
300	0.36	32.9	0.15	15.0	0.09	10.0
325	0.33	38.6	0.13	16.3	0.08	10.8
350	0.31	44.8	0.10	17.5	0.06	11.7
375	0.28	51.4	0.08	18.8	0.05	12.5
400	0.26	58.5	0.07	20.0	0.04	13.3
425	0.24	66.0	0.06	21.3	0.03	14.2
450	0.22	73.9	0.04	22.5	0.02	15.0
475	0.21	82.3	0.03	23.8	0.01	15.8
500	0.19	91.2	0.03	25.0	–	–
525	–	–	0.02	26.3	–	–
550	–	–	0.01	27.5	–	–
575	–	–	–	–	–	–
600	–	–	–	–	–	–

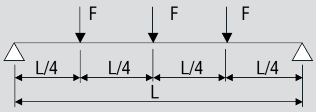
Single span with bending load in 1 axis
1 single load

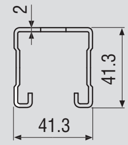




Span length [cm]	F [kN]	f [mm] ≤ σzul.	F1 [kN]	f [mm] ≤ σzul.	F2 [kN]	f [mm] ≤ σzul.
25	6.16	0.2	–	–	–	–
50	3.09	0.7	–	–	–	–
75	2.06	1.6	–	–	–	–
100	1.54	2.9	–	–	–	–
125	1.23	4.5	–	–	1.14	4.2
150	1.02	6.5	–	–	0.78	5.0
175	0.87	8.8	0.86	8.8	0.57	5.8
200	0.76	11.5	0.65	10.0	0.43	6.7
225	0.67	14.6	0.51	11.3	0.33	7.5
250	0.59	18.1	0.40	12.5	0.26	8.3
275	0.54	21.9	0.32	13.8	0.20	9.2
300	0.49	26.2	0.26	15.0	0.16	10.0
325	0.44	30.8	0.21	16.3	0.13	10.8
350	0.41	35.8	0.18	17.5	0.10	11.7
375	0.37	41.2	0.14	18.8	0.08	12.5
400	0.35	47.1	0.12	20.0	0.06	13.3
425	0.32	53.3	0.09	21.3	0.04	14.2
450	0.30	60.0	0.08	22.5	0.03	15.0
475	0.28	67.1	0.06	23.8	0.02	15.8
500	0.26	74.6	0.04	25.0	–	–
525	0.24	82.6	0.03	26.3	–	–
550	0.23	91.1	0.02	27.5	–	–
575	–	–	–	–	–	–
600	–	–	–	–	–	–

Single span with bending load in 1 axis
3 single loads



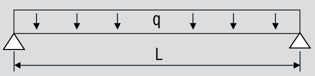


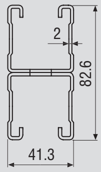
Span length [cm]	F [kN]	f [mm] ≤ σzul.	F1 [kN]	f [mm] ≤ σzul.	F2 [kN]	f [mm] ≤ σzul.
25	3.05	0.2	–	–	–	–
50	1.55	0.8	–	–	–	–
75	1.03	1.9	—	–	–	–
100	0.77	3.4	–	–	0.76	3.3
125	0.62	5.3	–	–	0.49	4.2
150	0.52	7.6	0.50	7.5	0.34	5.0
175	0.44	10.4	0.36	8.8	0.25	5.8
200	0.39	13.6	0.27	10.0	0.19	6.7
225	0.34	17.2	0.21	11.3	0.15	7.5
250	0.31	21.2	0.17	12.5	0.12	8.3
275	0.28	25.6	0.14	13.8	0.10	9.2
300	0.26	30.4	0.11	15.0	0.08	10.0
325	0.24	35.7	0.09	16.3	0.07	10.8
350	0.22	41.3	0.07	17.5	0.06	11.7
375	0.21	47.4	0.06	18.8	0.05	12.5
400	0.19	53.9	0.05	20.0	0.05	13.3
425	0.18	60.7	0.04	21.3	0.04	14.2
450	0.17	68.0	0.03	22.5	0.04	15.0
475	0.16	75.6	0.02	23.8	0.03	15.8
500	0.15	83.7	0.02	25.0	0.03	16.7
525	0.15	92.1	0.01	26.3	0.02	17.5
550	–	–	–	–	0.02	18.3
575	–	–	–	–	0.02	19.2
600	–	–	–	–	0.02	20.0

Single-span: tables for MQ-41D-F channel

F_1 at f = L/200, F_2 at f = L/300, F at $\sigma_{per.}$ incl. own weight of channel

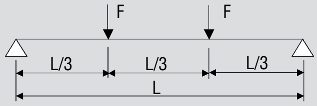
Single span with bending load in 1 axis uniformly distributed load

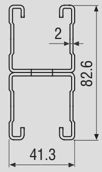




Span length [cm]	q [kN/m]	F [kN]	f [mm] ≤ σzul.	F1 [kN]	f [mm] ≤ σzul.	F2 [kN]	f [mm] ≤ σzul.
25	24.00	6.00	<0.1	–	–	–	–
50	12.00	6.00	0.2	–	–	–	–
75	8.00	6.00	0.5	–	–	–	–
100	6.00	6.00	1.2	–	–	–	–
125	4.80	6.00	2.4	–	–	–	–
150	3.99	5.98	4.1	–	–	–	–
175	2.92	5.11	5.6	–	–	–	–
200	2.23	4.45	7.3	–	–	4.04	6.7
225	1.75	3.94	9.3	–	–	3.16	7.5
250	1.41	3.52	11.5	–	–	2.53	8.3
275	1.16	3.18	13.9	3.16	13.8	2.07	9.2
300	0.97	2.90	16.5	2.62	15.0	1.71	10.0
325	0.82	2.65	19.4	2.21	16.3	1.43	10.8
350	0.70	2.45	22.5	1.87	17.5	1.20	11.7
375	0.60	2.26	25.8	1.60	18.8	1.02	12.5
400	0.53	2.10	29.3	1.38	20.0	0.86	13.3
425	0.46	1.96	33.1	1.19	21.3	0.74	14.2
450	0.41	1.83	37.1	1.03	22.5	0.63	15.0
475	0.36	1.71	41.4	0.90	23.8	0.53	15.8
500	0.32	1.60	45.8	0.78	25.0	0.45	16.7
525	0.29	1.51	50.5	0.68	26.3	0.38	17.5
550	0.26	1.42	55.4	0.59	27.5	0.32	18.3
575	0.23	1.34	60.6	0.51	28.8	0.26	19.2
600	0.21	1.26	66.0	0.44	30.0	0.21	20.0

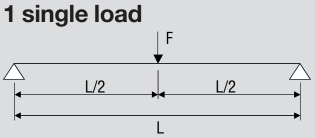
Single span with bending load in 1 axis 2 single loads

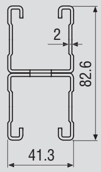




Span length [cm]	F [kN]	f [mm] ≤ σzul.	F1 [kN]	f [mm] ≤ σzul.	F2 [kN]	f [mm] ≤ σzul.
25	3.00	<0.1	–	–	–	–
50	3.00	0.2	–	–	–	–
75	3.00	0.7	–	–	–	–
100	3.00	1.7	–	–	–	–
125	2.70	2.9	–	–	–	–
150	2.24	4.2	–	–	–	–
175	1.92	5.7	–	–	–	–
200	1.67	7.5	–	–	1.48	6.7
225	1.48	9.5	–	–	1.16	7.5
250	1.32	11.7	–	–	0.93	8.3
275	1.19	14.2	1.16	13.8	0.76	9.2
300	1.09	16.8	0.96	15.0	0.63	10.0
325	1.00	19.8	0.81	16.3	0.52	10.8
350	0.92	22.9	0.69	17.5	0.44	11.7
375	0.85	26.3	0.59	18.8	0.37	12.5
400	0.79	29.9	0.51	20.0	0.32	13.3
425	0.73	33.8	0.44	21.3	0.27	14.2
450	0.69	37.9	0.38	22.5	0.23	15.0
475	0.64	42.2	0.33	23.8	0.20	15.8
500	0.60	46.7	0.29	25.0	0.17	16.7
525	0.57	51.5	0.25	26.3	0.14	17.5
550	0.53	56.5	0.22	27.5	0.12	18.3
575	0.50	61.7	0.19	28.8	0.09	19.2
600	0.47	67.2	0.16	30.0	0.08	20.0

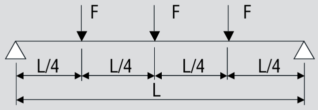
Single span with bending load in 1 axis 1 single load

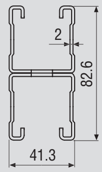




Span length [cm]	F [kN]	f [mm] ≤ σzul.	F1 [kN]	f [mm] ≤ σzul.	F2 [kN]	f [mm] ≤ σzul.
25	6.00	<0.1	–	–	–	–
50	6.00	0.2	–	–	–	–
75	6.00	0.8	–	–	–	–
100	4.51	1.5	–	–	–	–
125	3.60	2.3	–	–	–	–
150	2.99	3.3	–	–	–	–
175	2.55	4.5	–	–	–	–
200	2.23	5.9	–	–	–	–
225	1.97	7.5	–	–	–	–
250	1.76	9.2	–	–	1.58	8.3
275	1.59	11.2	–	–	1.29	9.2
300	1.45	13.3	–	–	1.07	10.0
325	1.33	15.7	–	–	0.89	10.8
350	1.22	18.2	1.17	17.5	0.75	11.7
375	1.13	21.0	1.00	18.8	0.64	12.5
400	1.05	23.9	0.86	20.0	0.54	13.3
425	0.98	27.0	0.75	21.3	0.46	14.2
450	0.91	30.4	0.65	22.5	0.39	15.0
475	0.86	33.9	0.56	23.8	0.33	15.8
500	0.80	37.7	0.49	25.0	0.28	16.7
525	0.75	41.7	0.42	26.3	0.24	17.5
550	0.71	45.9	0.37	27.5	0.20	18.3
575	0.67	50.3	0.32	28.8	0.16	19.2
600	0.63	55.0	0.27	30.0	0.13	20.0

Single span with bending load in 1 axis 3 single loads



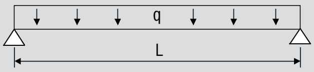


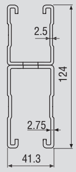
Span length [cm]	F [kN]	f [mm] ≤ σzul.	F1 [kN]	f [mm] ≤ σzul.	F2 [kN]	f [mm] ≤ σzul.
25	2.00	<0.1	–	–	–	–
50	2.00	0.2	–	–	–	–
75	2.00	0.6	–	–	–	–
100	2.00	1.5	–	–	–	–
125	1.81	2.7	–	–	–	–
150	1.51	3.9	–	–	–	–
175	1.29	5.3	–	–	–	–
200	1.13	6.9	–	–	1.08	6.7
225	1.01	8.8	–	–	0.86	7.5
250	0.90	10.8	–	–	0.69	8.3
275	0.82	13.1	–	–	0.57	9.2
300	0.75	15.6	0.69	15.0	0.48	10.0
325	0.69	18.3	0.58	16.3	0.41	10.8
350	0.64	21.2	0.49	17.5	0.35	11.7
375	0.60	24.3	0.42	18.8	0.30	12.5
400	0.56	27.7	0.36	20.0	0.27	13.3
425	0.53	31.2	0.31	21.3	0.24	14.2
450	0.50	34.9	0.27	22.5	0.21	15.0
475	0.47	38.9	0.24	23.8	0.19	15.8
500	0.45	43.0	0.21	25.0	0.17	16.7
525	0.43	47.4	0.18	26.3	0.15	17.5
550	0.41	51.9	0.15	27.5	0.14	18.3
575	0.39	56.7	0.13	28.8	0.12	19.2
600	0.37	61.6	0.11	30.0	0.11	20.0

Single-span: tables for MQ-52-72D-F channel

F_1 at f = L/200, F_2 at f = L/300, F at $\sigma_{per.}$ incl. own weight of channel

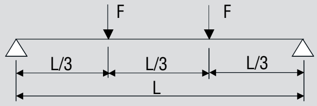
Single span with bending load in 1 axis uniformly distributed load

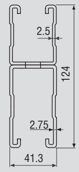




Span length [cm]	q [kN/m]	F [kN]	f [mm] ≤ σzul.	F1 [kN]	f [mm] ≤ σzul.	F2 [kN]	f [mm] ≤ σzul.
25	44.80	11.20	<0.1	–	–	–	–
50	22.40	11.20	<0.1	–	–	–	–
75	14.93	11.20	0.3	–	–	–	–
100	11.20	11.20	0.6	–	–	–	–
125	8.96	11.20	1.2	–	–	–	–
150	7.47	11.20	2.1	–	–	–	–
175	6.40	11.20	3.3	–	–	–	–
200	5.60	11.20	4.9	–	–	–	–
225	4.42	9.94	6.2	–	–	–	–
250	3.56	8.91	7.6	–	–	–	–
275	2.93	8.07	9.2	–	–	8.01	9.2
300	2.45	7.36	11.0	–	–	6.68	10.0
325	2.08	6.76	12.9	–	–	5.64	10.8
350	1.78	6.24	15.0	–	–	4.82	11.7
375	1.54	5.79	17.2	–	–	4.15	12.5
400	1.35	5.40	19.5	–	–	3.59	13.3
425	1.19	5.04	22.0	4.85	21.3	3.13	14.2
450	1.05	4.73	24.7	4.28	22.5	2.75	15.0
475	0.94	4.45	27.5	3.79	23.8	2.41	15.8
500	0.84	4.19	30.5	3.37	25.0	2.13	16.7
525	0.75	3.96	33.6	3.00	26.3	1.88	17.5
550	0.68	3.74	36.9	2.69	27.5	1.66	18.3
575	0.62	3.54	40.4	2.41	28.8	1.47	19.2
600	0.56	3.36	43.9	2.16	30.0	1.30	20.0

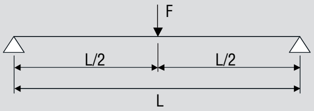
Single span with bending load in 1 axis 2 single loads

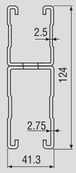




Span length [cm]	F [kN]	f [mm] ≤ σzul.	F1 [kN]	f [mm] ≤ σzul.	F2 [kN]	f [mm] ≤ σzul.
25	5.60	<0.1	–	–	–	–
50	5.60	0.1	–	–	–	–
75	5.60	0.3	–	–	–	–
100	5.60	0.8	–	–	–	–
125	5.60	1.6	–	–	–	–
150	5.60	2.8	–	–	–	–
175	4.82	3.8	–	–	–	–
200	4.21	5.0	–	–	–	–
225	3.73	6.3	–	–	–	–
250	3.34	7.8	–	–	–	–
275	3.02	9.4	–	–	2.94	9.2
300	2.76	11.2	–	–	2.45	10.0
325	2.53	13.2	–	–	2.07	10.8
350	2.34	15.3	–	–	1.77	11.7
375	2.17	17.5	–	–	1.52	12.5
400	2.02	19.9	–	–	1.32	13.3
425	1.89	22.5	1.78	21.3	1.15	14.2
450	1.77	25.2	1.57	22.5	1.01	15.0
475	1.67	28.1	1.39	23.8	0.89	15.8
500	1.57	31.1	1.24	25.0	0.78	16.7
525	1.48	34.3	1.10	26.3	0.69	17.5
550	1.40	37.7	0.99	27.5	0.61	18.3
575	1.33	41.2	0.88	28.8	0.54	19.2
600	1.26	44.8	0.79	30.0	0.48	20.0

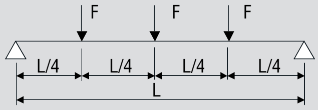
Single span with bending load in 1 axis 1 single load

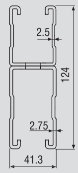




Span length [cm]	F [kN]	f [mm] ≤ σzul.	F1 [kN]	f [mm] ≤ σzul.	F2 [kN]	f [mm] ≤ σzul.
25	11.20	<0.1	–	–	–	–
50	11.20	0.1	–	–	–	–
75	11.20	0.4	–	–	–	–
100	11.20	1.0	–	–	–	–
125	9.04	1.5	–	–	–	–
150	7.52	2.2	–	–	–	–
175	6.43	3.0	–	–	–	–
200	5.61	3.9	–	–	–	–
225	4.97	5.0	–	–	–	–
250	4.45	6.1	–	–	–	–
275	4.03	7.4	–	–	–	–
300	3.68	8.8	–	–	–	–
325	3.38	10.4	–	–	–	–
350	3.12	12.1	–	–	3.01	11.7
375	2.90	13.9	–	–	2.59	12.5
400	2.70	15.8	–	–	2.25	13.3
425	2.52	17.9	–	–	1.96	14.2
450	2.36	20.1	–	–	1.72	15.0
475	2.22	22.4	–	–	1.51	15.8
500	2.09	24.9	–	–	1.33	16.7
525	1.98	27.5	1.88	26.3	1.17	17.5
550	1.87	30.2	1.68	27.5	1.04	18.3
575	1.77	33.1	1.50	28.8	0.92	19.2
600	1.68	36.1	1.35	30.0	0.81	20.0

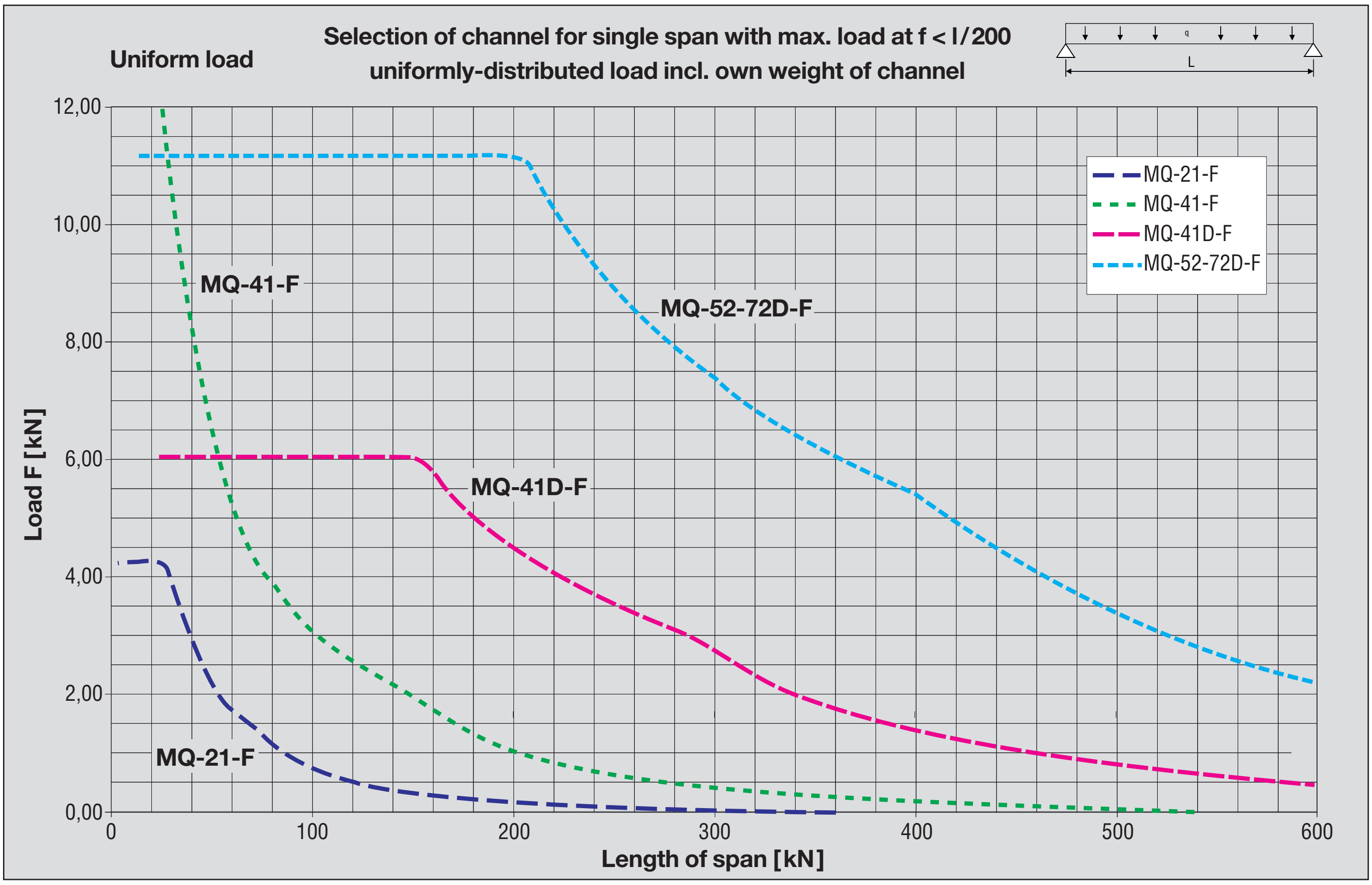
Single span with bending load in 1 axis 3 single loads

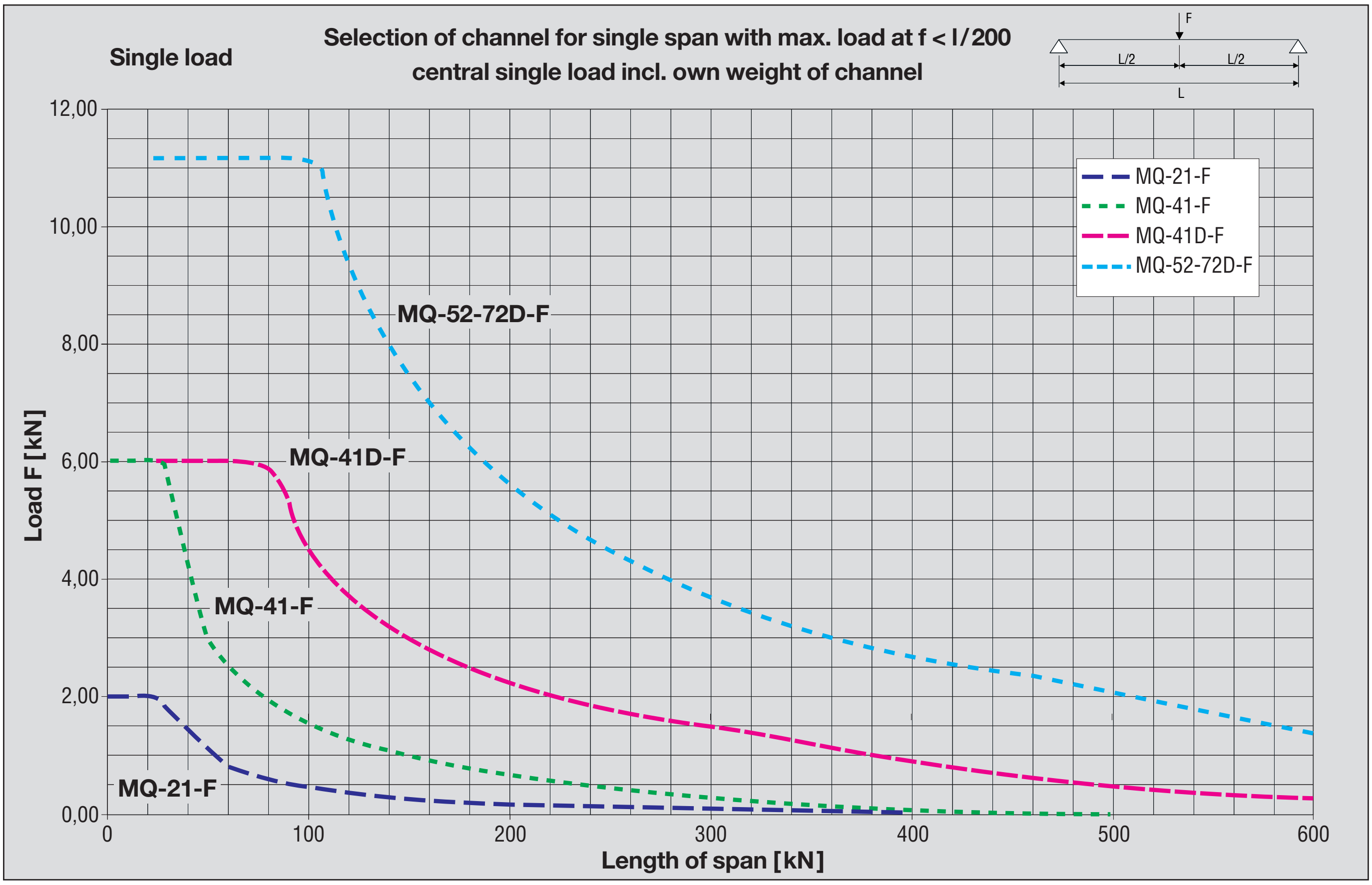




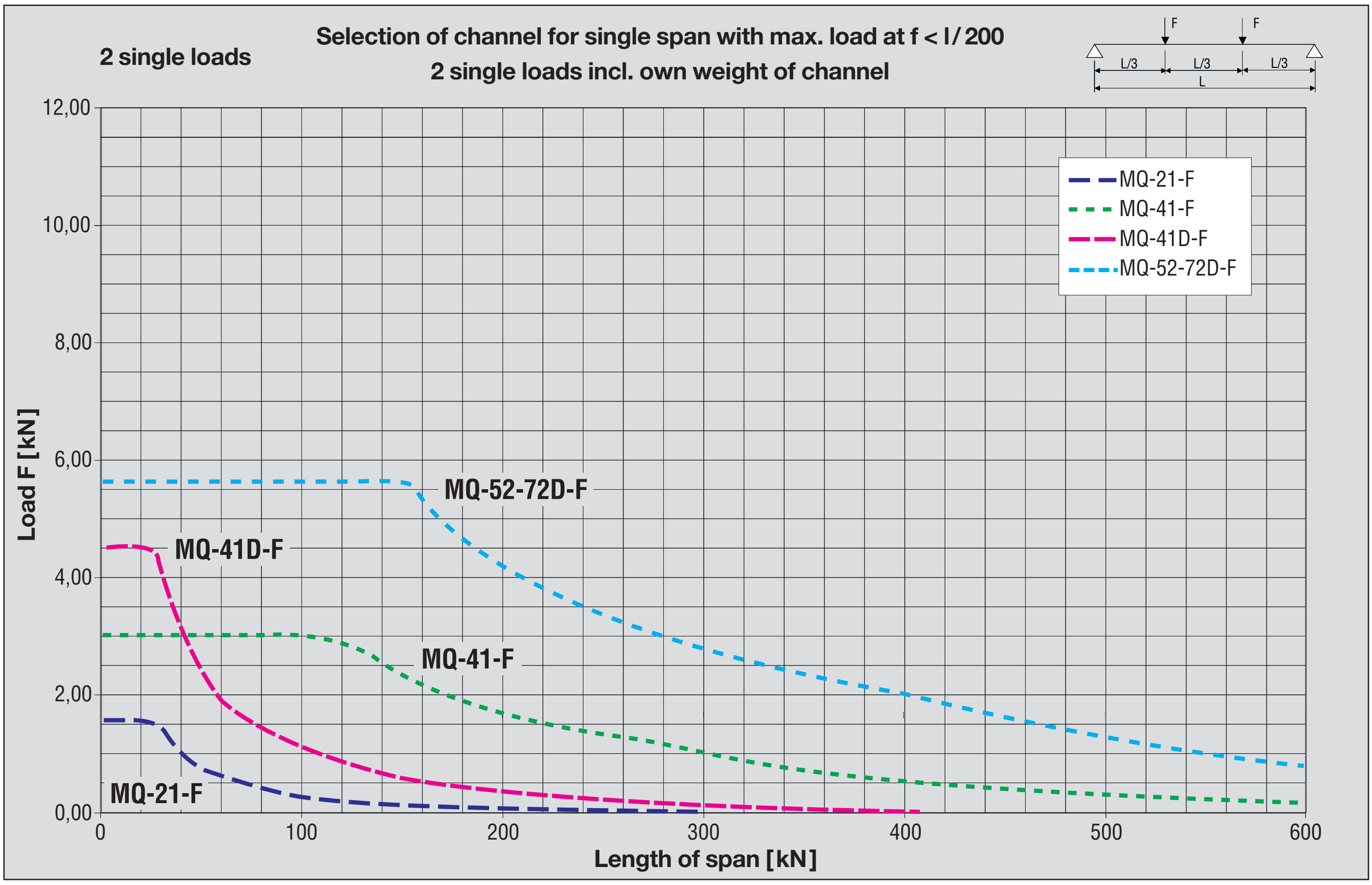
Span length [cm]	F [kN]	f [mm] ≤ σzul.	F1 [kN]	f [mm] ≤ σzul.	F2 [kN]	f [mm] ≤ σzul.
25	3.73	<0.1	–	–	–	–
50	3.73	<0.1	–	–	–	–
75	3.73	0.3	–	–	–	–
100	3.73	0.8	–	–	–	–
125	3.73	1.5	–	–	–	–
150	3.73	2.6	–	–	–	–
175	3.24	3.5	–	–	–	–
200	2.84	4.6	–	–	–	–
225	2.52	5.9	–	–	–	–
250	2.27	7.2	–	–	–	–
275	2.06	8.7	–	–	–	–
300	1.89	10.4	–	–	1.81	10.0
325	1.74	12.2	–	–	1.54	10.8
350	1.62	14.1	–	–	1.33	11.7
375	1.51	16.2	–	–	1.15	12.5
400	1.41	18.5	–	–	1.01	13.3
425	1.33	20.8	1.28	21.3	0.90	14.2
450	1.25	23.3	1.13	22.5	0.80	15.0
475	1.19	26.0	1.00	23.8	0.71	15.8
500	1.13	28.8	0.89	25.0	0.64	16.7
525	1.07	31.7	0.79	26.3	0.58	17.5
550	1.02	34.7	0.71	27.5	0.53	18.3
575	0.98	37.9	0.63	28.8	0.48	19.2
600	0.94	41.3	0.57	30.0	0.44	20.0

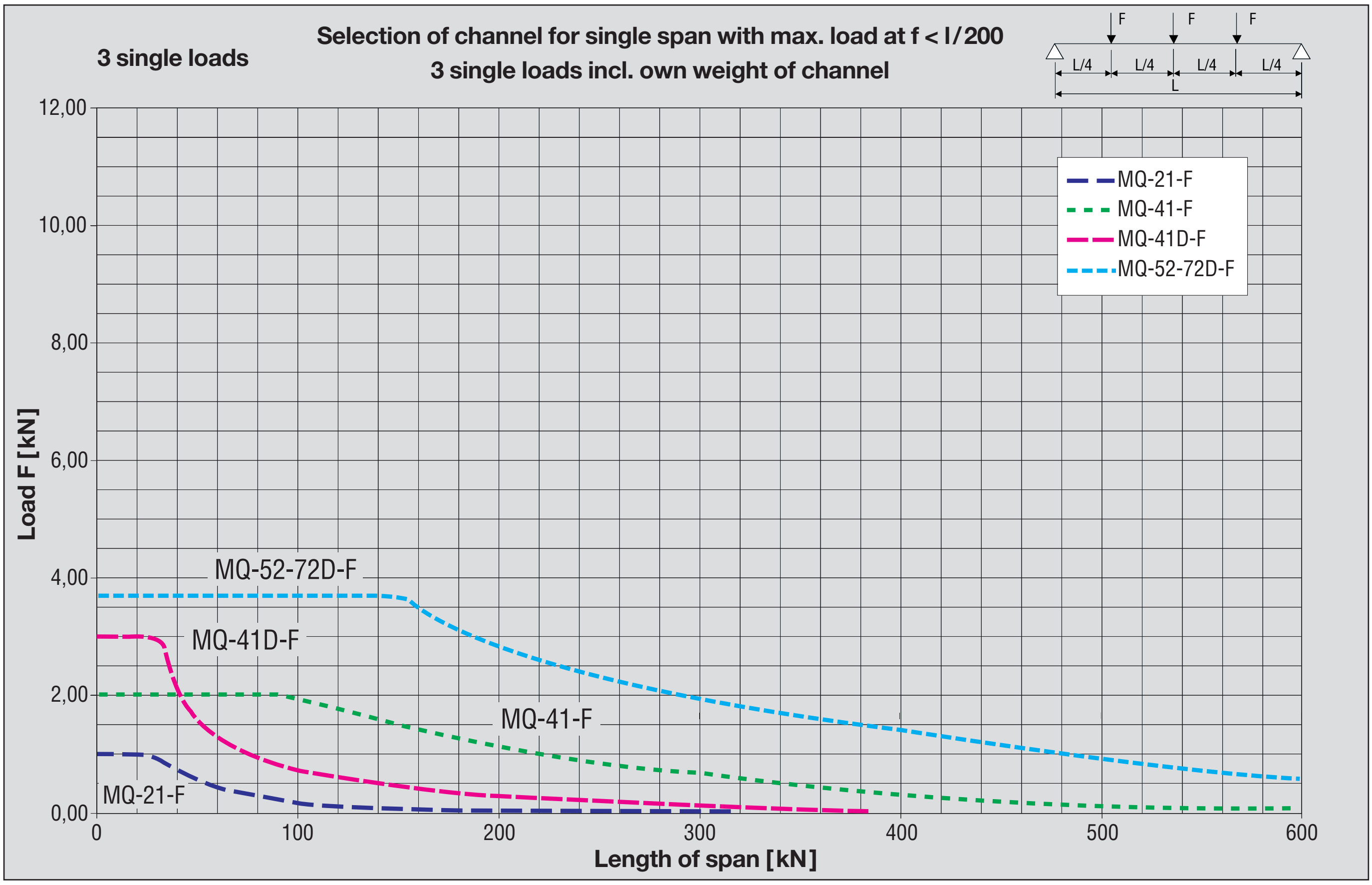
MQ channel for single-span with bending load in one axis





MQ channel for single-span with bending load in one axis

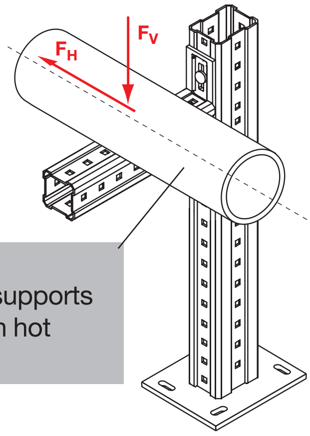




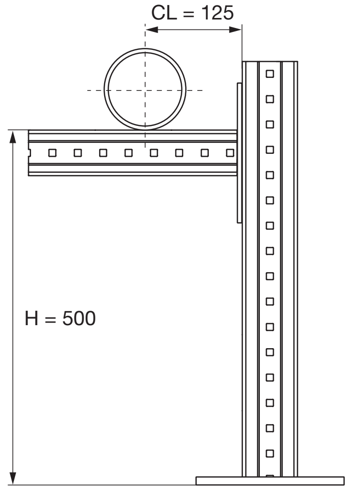
Design calculation example for MI and MQ

Calculation example

L-Post



Ø 150 pipe
span between supports
3.5 m, filled with hot
water



1. Calculation of working loads

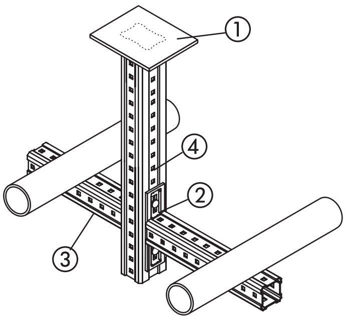
1 pipe Ø 150 mm, filled with hot water, span between supports 3.5 m

weight	span	weight of pipe	load of pipe	
48 kg / m	3.50 m	168 kg	1648 N	1.648 kN = F_V

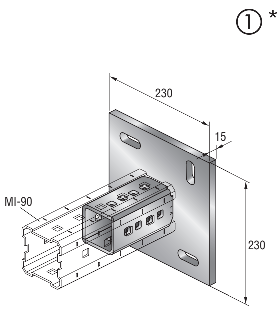
vert. Load	*	friction factor	=	horiz. load	
1648 N	*	0.15	=	247 N	0.247 kN = F_H

I. Check whether a given load is possible (total support)

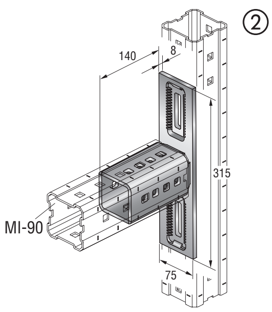
1. Lorraine cross (page 5.45)



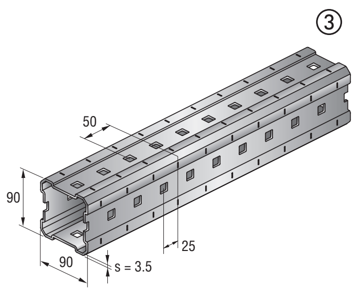
Lorraine cross



MIC-C90-D

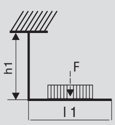


MIC-90-L



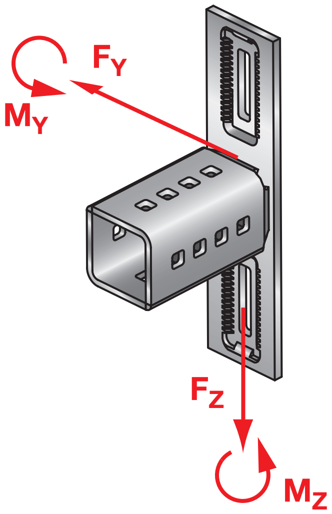
MI-90

Vertical MI-90 girder (recommended working load F_Z [kN])

Configuration	Cantilever dimensions [mm]	$F_Z = q \cdot l$ Loading condition 1 uniform loading Fz [kN]		F_Z ½ ½ Loading condition 2 single load Fz [kN]		F_Z Loading condition 3 Fz [kN]		F_Z F_Z ⅓ ⅓ ⅓ Loading condition 4 Fz [kN]		F_Z F_Z F_Z ¼ ¼ ¼ ¼ Loading condition 5 Fz [kN]	
	l1 \ h1	500	750	500	750	500	750	500	750	500	750
	300	3.650	3.650	3.650	3.650	2.060	2.060	1.820	1.820	1.210	1.210
	500	2.380	2.380	2.380	2.380	1.290	1.290	1.190	1.190	0.790	0.790
	Fx = Fz × 0.15**										
	300	3.630	3.630	3.630	3.630	1.950	1.950	1.810	1.810	1.210	1.210
	500	2.300	2.300	2.300	2.300	1.150	1.150	1.150	1.150	0.760	0.760

II. Check whether a given load is possible (single parts)

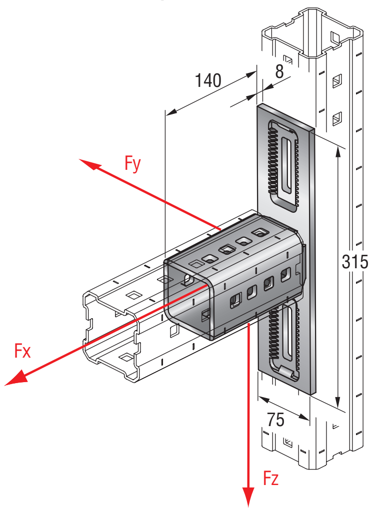
1. MIC-90-L – Determination of working loads



F_Y	=	F_H	0.247 kN					
F_Z	=	F_V	1.648 kN					
M_Y	=	F_V 1648 N	*	CL 0.125 m	=	206 Nm	=	206 Nm / 0,206 kNm
M_Z	=	F_H 247 N	*	CL 0.125 m	=	31 Nm	=	31 Nm / 0,031 kNm

Check with recommended loads:

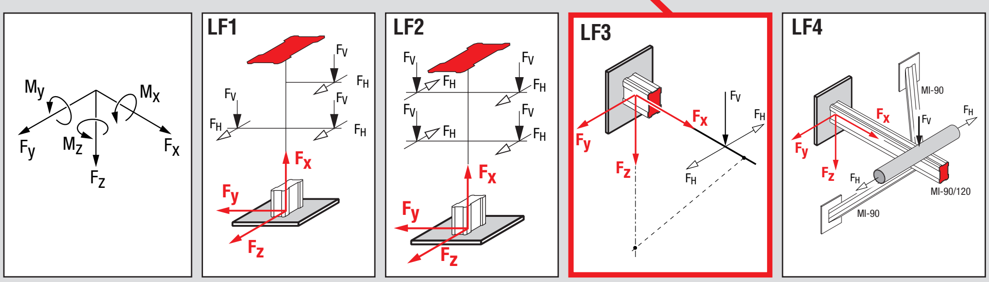
MIC-90-L on MI-90 or MI-120 girder



Loading:	± Fyrec [kN]	± Fxrec [kN]	± Fzrec [kN]	± Myrec [kNm]	± Mxrec [kNm]	± Mzrec [kNm]
Fx		8.26				
Fy // Fz*	13.20		18.60			
Fy + Fz	13.20		18.60			
Mz	0.60					0.15
My			5.08	0.67		
FxMy		3.51		0.67		
FxMz	0.40	1.40				0.10
Mx	2.50				0.50	
Mx			2.50		0.50	
LF1	13.20	3.10	18.60	0.67	0.10	
LF2a		6.30	2.00		0.50	
LF2b	2.00	6.30			0.50	
LF3 oST	0.38		2.50	0.55	0.03	0.08

*Only loading in one direction is permissible (// = or).

Moments and loading configurations



F_V = vertical load
F_H = horizontal load

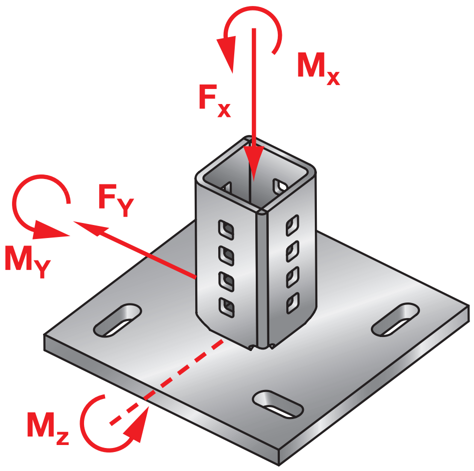
LF = loading configuration

LF2a = Moment M_X induced by F_Z
LF2b = Moment M_X induced by F_Y

LF3ST = cantilever with support
LF3oST = cantilever without support

—> The maximum load of the MIC-90-L is not reached!

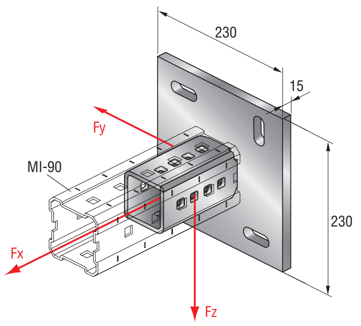
2. MIC-C90-D – Determination of working loads



F_X	=	F_V	1.648 kN					
F_Y	=	F_H	0.247 kN					
M_Y	=	F_V 1648 N	*	CL 0.125 m	=	206 Nm	=	206 Nm / **0,206 kNm**
M_Z	=	F_H 247 N	*	CL 0.5 m	=	124 Nm	=	31 Nm / **0,124 kNm**
M_X	=	F_H 247 N	*	CL 0.125 m	=	31 Nm	=	31 Nm / **0,031 kNm**

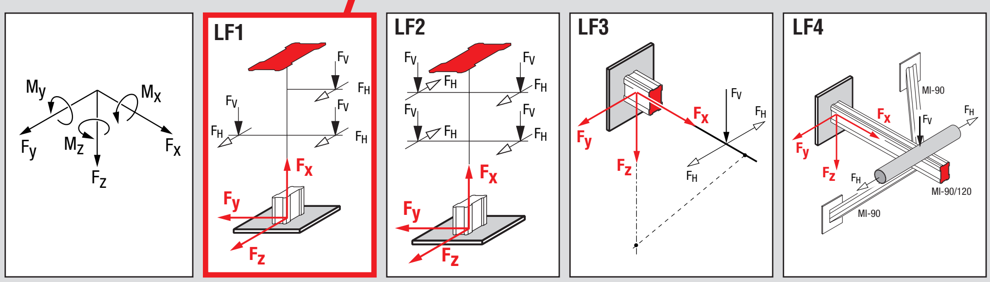
Check with recommended loads:

MIC-C90-D



Loading:	± Fy_{rec} [kN]	± Fx_{rec} [kN]	± Fz_{rec} [kN]	± My_{rec} [kNm]	± Mx_{rec} [kNm]	± Mz_{rec} [kNm]
Fx		22.00				
Fy // Fz*	28.10		28.10			
Fy + Fz	28.10		28.10			
My			7.20	0.67 **(0.88)**		
Mz	7.20					0.67
FxMz	4.40	7.00				0.67
FxMy		7.00	4.40	0.67 **(0.88)**		
Mx			13.30		1.82 **(2.74)**	
Mx	13.30				1.82 **(2.74)**	
LF1a	2.70	7.40	2.70	0.67	0.21	0.67
LF2a		8.70	2.00		0.50	
LF2b	2.00	8.70			0.50	
LF3 oST	2.00		7.00	0.67 **(0.88)**		0.23
LF3 ST	2.50	7.00	7.00			0.67
LF4	15.00	12.00	15.00			

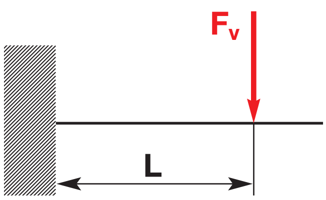
Moments and loading configurations



F_V = vertical load
F_H = horizontal load
LF = loading configuration
LF1a/b = different loads, see tables
LF2a = Moment M_X induced by F_Z
LF2b = Moment M_X induced by F_y
LF3ST = cantilever with support
LF3oST = cantilever without support

—> The maximum load of the MIC-90-L is not reached!

3. Horizontal MI-90



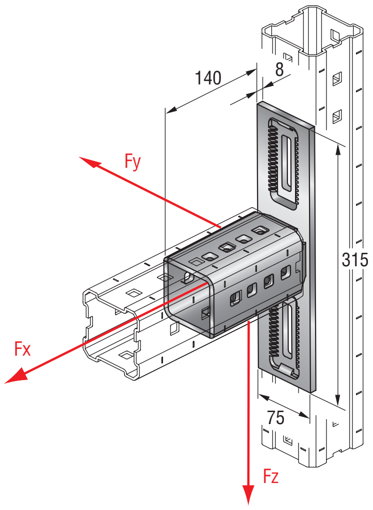
$$M_b = F * L = \sigma_{per} * S_y \Rightarrow F_{Vmax} = \frac{\sigma_{per} * S_y}{CL}$$

F_{max}	=	σ_{per}	*	S_Y	/	CL		
F_{max}	=	152 N/mm²	*	25.63 cm³	/	0.125 m	=	**31,17 kN**

III. Determine max. load of support

1. MIC-90-L – Determination of max. allowable loads

MIC-90-L on MI-90 or MI-120 girder



Loading:	± Fy_{rec} [kN]	± Fx_{rec} [kN]	± Fz_{rec} [kN]	± My_{rec} [kNm]	± Mx_{rec} [kNm]	± Mz_{rec} [kNm]
Fx		8.26				
Fy // Fz*	13.20		18.60			
Fy + Fz	13.20		18.60			
Mz	0.60					0.15
My			5.08	0.67		
FxMy		3.51		0.67		
FxMz	0.40	1.40				0.10
Mx	2.50				0.50	
Mx			2.50		0.50	
LF1	13.20	3.10	18.60	0.67	0.10	
LF2a		6.30	2.00		0.50	
LF2b	2.00	6.30			0.50	
LF3 oST	0.38		2.50	0.55	0.03	0.08

*Only loading in one direction is permissible (// = or).

F_Y

$F_Y = F_V * 0.15 \Rightarrow F_{Vmax} = F_{Yrec} / 0.15$

F_{Vmax} = **0.38 kN** / 0.15 → **2.53 kN**

F_Z

$F_Z = \mathbf{F_V} \Rightarrow F_{Vmax} = F_{Zrec}$

F_{Vmax} = **2.50 kN** → **2.50 kN**

M_Y

$M_Y = \mathbf{F_V} * CL \Rightarrow F_{Vmax} = M_{Yrec} / CL$

F_{Vmax} = **0.55 kNm** / 0.125 m → **4.40 kN**

M_Z

$M_Z = F_H [F_V * 0.15] * CL \Rightarrow F_{Vmax} = M_{Zrec} / CL * 0.15$

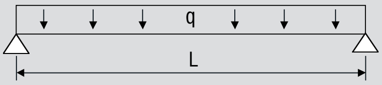
F_{Vmax} = **0.08 kNm** / 0.125 * 0.15 → **4.27 kN**

Calculation formulas

Technical Data

Single span: formulas

Loading condition 1:
Single-span with uniform load, distance between supports: L



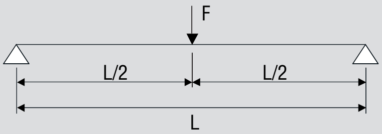
$$M_{max} = \frac{q * L^2 \leq}{8} = \sigma_{per} * W$$

$$q = \frac{8 * \sigma_{per} * W}{L^2 \leq}$$

$$f_{max} = \frac{5}{384} * \frac{q * L^4}{E * I}$$

$$q = \frac{384}{5} * \frac{E * I * f_{max}}{L^4}$$

Loading condition 2:
Single span with single load in center of span L/2



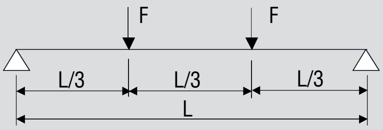
$$M_{max} = \frac{F * L}{4} = \sigma_{per} * W$$

$$F = \frac{4 * \sigma_{per} * W}{L}$$

$$f_{max} = \frac{1}{48} * \frac{F * L^3}{E * I}$$

$$F = 48 * \frac{E * I * f_{max}}{L^3}$$

Loading condition 3:
Single span with 2 loads, each at L/3



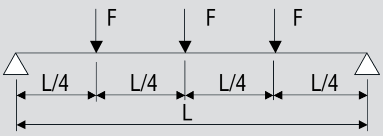
$$M_{max} = \frac{F * L}{3} = \sigma_{per} * W$$

$$F = \frac{3 * \sigma_{per} * W}{L}$$

$$f_{max} = \frac{23}{648} * \frac{F * L^3}{E * I}$$

$$F = \frac{648}{23} * \frac{E * I * f_{max}}{L^3}$$

Loading condition 4:
Single span with 3 loads, each at L/4



$$M_{max} = \frac{F * L}{2} = \sigma_{per} * W$$

$$F = \frac{2 * \sigma_{per} * W}{L}$$

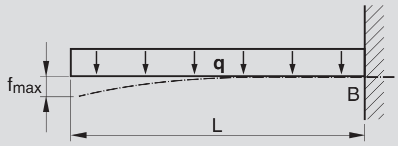
$$f_{max} = 0.04948 * \frac{F * L^3}{E * I}$$

$$F = \frac{1}{0.04948} * \frac{E * I * f_{max}}{L^3}$$

M = bending moment	[kNcm]	E = modulus of elasticity	[kN/cm²]
F = single load	[kN]	I = moment of inertia	[cm⁴]
q = uniform load	[kN/cm]	W = section modulus	[cm³]
L = girder length	[cm]	f = deflection	[cm]
σ = stress	[kN/cm²]		

Cantilever: formulas

Loading condition 1:
Cantilever with uniform load, cantilever length: L



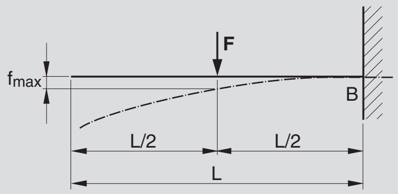
$$M_B = \frac{q * L^2}{2} = \sigma_{per} * W$$

$$q = \frac{2 * \sigma_{per} * W}{L^2}$$

$$f_{max} = \frac{1}{8} * \frac{q * L^4}{E * I}$$

$$q = 8 * \frac{E * I * f_{max}}{L^4}$$

Loading condition 2:
Cantilever with single load in center of cantilever length L/2



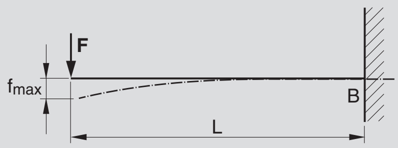
$$M_B = F * L/2 = \sigma_{per} * W$$

$$F = \frac{2 * \sigma_{per} * W}{L}$$

$$f_{max} = \frac{1}{24} * \frac{F * L^3}{E * I}$$

$$F = 24 * \frac{E * I * f_{max}}{L^3}$$

Loading condition 3:
Cantilever with single load at end of cantilever length L



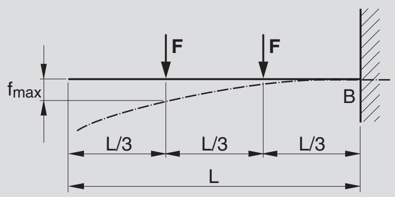
$$M_B = F * L = \sigma_{per} * W$$

$$F = \frac{\sigma_{per} * W}{L}$$

$$f_{max} = \frac{1}{3} * \frac{F * L^3}{E * I}$$

$$F = 3 * \frac{E * I * f_{max}}{L^3}$$

Loading condition 4:
Cantilever with 2 loads, each at L/3



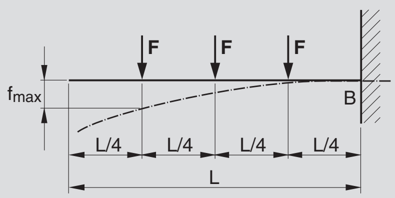
$$M_B = F * L$$

$$F = \frac{\sigma_{per} * W}{L}$$

$$f_{max} = 0.12963 * \frac{F * L^3}{E * I}$$

$$F = \frac{1}{0.12963} * \frac{E * I * f_{max}}{L^3}$$

Loading condition 5:
Cantilever with 3 loads, each at L/4



$$M_B = \frac{3 * F * L}{2} = \sigma_{per} * W$$

$$F = \frac{2 * \sigma_{per} * W}{3 * L}$$

$$f_{max} = 0.24219 * \frac{F * L^3}{E * I}$$

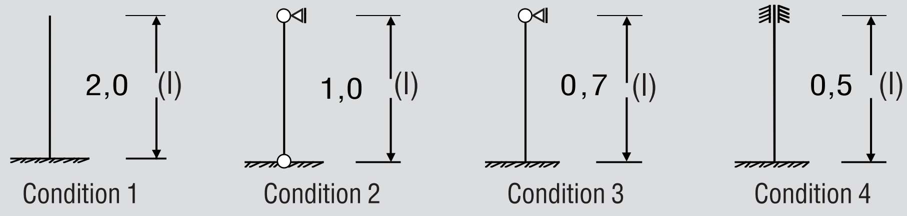
$$F = \frac{1}{0.24219} * \frac{E * I * f_{max}}{L^3}$$

M_b	= bending moment	[kN/cm]	L	= girder length	[cm]	I	= moment of inertia	[cm^4]
F	= single load	[kN]	σ	= stress	[kN/cm^2]	W	= section modulus	[cm^3]
q	= uniform load	[kN/cm]	E	= modulus of elasticity	[kN/cm^2]	f	= deflection	[cm]

Flexural buckling: formulas

Flexural bending:

Member length l (cm)
Euler factor β
s_k (cm) effective length = l * β
i (cm) radius of gyration
A (cm^2) surface
Modulus of elasticity
= 21000 kN/cm^2
Yield point $β_s$ (kN/cm^2)
= $f_{y,k}$ (depends on channel)
π = 3.14159



Determination of relative slenderness ratio and auxiliary variable

y-axis:

$λ_y = S_{ky} / i_y \leq 250$
$σ'_{Ki} = π^2 * E / λ_y^2$
$λ_a = π * \sqrt{(E / β_s)}$
$\overline{λ'}_{ky} = λ_y / λ_a$

y-axis:

$λ_z = S_{kz} / i_z < 250$
$σ'_{Ki} = π^2 * E / λ_z^2$
$λ_a = π * \sqrt{(E / β_s)}$
$\overline{λ'}_{kz} = λ_z / λ_a$

Determining the ultimate load under normal force

a) C-profile with edge stiffening → buckling stress line “b” → α = 0.34 (C-profile with flanged edge). **Applies to MQ system.**
b) Hollow profile → buckling stress line «α» → α = 0.21. **Applies to System MI.**
The cross section is able to carry the load over its entire surface (verified in buckling tests)

Buckling coefficient

y-axis:

$k'_y = 0.5 * (1+α' * (\overline{λ'}_{ky}-0.2) + \overline{λ'}_{ky}^2)$

$κ'_y = \dfrac{1}{k'_y + \sqrt{k'^2_y - \overline{λ}'^2_{ky}}} \leq 1$

z-axis:

$k'_z = 0.5 * (1+α' * (\overline{λ'}_{kz}-0.2) + \overline{λ'}_{kz}^2)$

$κ'_z = \dfrac{1}{k'_z + \sqrt{k'^2_z - \overline{λ}'^2_{kz}}} \leq 1$

1) Upsetting force

y-axis:

$N_u^D = A * β_s$ (kN)

z-axis:

$N_u^D = A * β_s$ (kN)

2) Buckling load

y-axis:

$N_{u;y}^B = κ'_y * A * β_s$ (kN)

z-axis:

$N_{u;z}^B = κ'_z * A *$ (kN)

3) Ultimate load

y-axis:

$N_u = \min. (N_u^D; N_{u;y,z}^B)$ (kN)

4) Safety and verification

	$λ_F$ action	$λ_M$ action
Constant action	$1.35 = γ_G$	$1.10 = γ_M$
Variable action	$1.50 = γ_Q$	$1.10 = γ_M$

Action: $S_D = G_K * γ_G + Q_K * λ_Q$
Resistance: $R_D = N_u / γ_M$

Verification: $S_D / R_D \leq 1$

General information about pipes

Technical Data

Pipes – dimensions, weights, spacing

DN[1]	Size	Pipe outside dia	Wall thickness	Empty	Weight of water-filled pipe	With insulation	Max. rec. distance between supports
NW	inches	mm	mm	kg/m	kg/m	kg/m	m
Threaded pipe as per DIN 2440 (medium gauge)							
8	1/4"	13.5	2.35	0.65			
10	3/8"	17.2	2.35	0.85	1.01	1.3	2.25
15	1/2"	21.3	2.65	1.22	1.47	1.8	2.75
20	3/4"	26.9	2.65	1.58	2.02	2.4	3.00
25	1 "	33.7	3.25	2.44	3.13	3.9	3.50
32	1 1/4"	42.4	3.25	3.14	4.30	5.7	3.75
40	1 1/2"	48.3	3.25	3.61	5.15	6.6	4.25
50	2 "	60.3	3.65	5.10	7.55	9.9	4.75
65	2 1/2"	76.1	3.65	6.51	10.52	15.0	5.50
80	3 "	88.9	4.05	8.47	13.98	19.9	6.00
100	4 "	114.3	4.50	12.10	21.30	30.9	6.00
125	5 "	139.7	4.85	16.20	30.17	40.6	6.00
150	6 "	165.1	4.85	19.20	39.06	50.4	6.00
Steel pipe (boiler pipe) as per DIN 2448							
10		17.2	1.80	0.69	0.83	1.5	2.25
15		21.3	2.00	0.96	1.20	2.5	2.75
20		26.9	2.30	1.40	1.80	3.2	3.00
25		33.7	2.60	1.99	2.65	4.3	3.50
32		44.5	2.60	2.70	3.91	5.5	3.75
40		48.3	2.60	2.93	4.41	6.0	4.25
		51.0	2.60	3.10	4.77	6.5	4.40
50		57.0	2.90	3.87	5.96	7.6	4.60
		60.3	2.90	4.11	6.47	9.0	4.75
		63.5	2.90	4.33	6.97	9.5	4.75
65		76.1	2.90	5.24	9.16	13.9	5.50
		82.5	3.20	6.26	10.86	15.2	5.75
80		88.9	3.20	6.76	12.15	18.4	6.00
		101.6	3.60	8.70	15.76	24.8	6.00
		108.0	3.60	9.27	17.31	27.5	6.00
100		114.3	3.60	9.83	18.90	28.8	6.00
		127.0	4.00	12.10	23.32	35.1	6.00
		133.0	4.00	12.70	25.07	36.5	6.00
125		139.7	4.00	13.40	27.12	38.2	6.00
		152.4	4.50	16.40	32.54	46.5	6.00
		159.0	4.50	17.10	34.76	48.9	6.00
150		168.3	4.50	18.20	36.93	50.6	6.00
		177.8	5.00	21.30	43.40	58.9	6.00
		193.7	5.60	26.00	51.26	66.5	6.00
200		219.1	6.30	33.10	64.73	79.5	6.00
		244.5	6.30	37.00	91.40	108.5	6.00
250		273.0	6.30	41.40	95.40	111.7	6.00
300		323.9	7.10	55.50	130.85	150.0	6.00
350		355.6	8.00	68.60	159.2	198.2	6.00
400		406.4	8.80	86.30	204.40	227.7	6.00
500		508.0	11.00	135.00	320.50	345.5	6.00
Stainless steel pipe as per DIN 17455, series 1							
		17.2	1.00	0.63	0.78	1.45	1.25
		21.3	2.00	0.97	1.21	2.50	1.50
		26.9	2.00	1.25	1.66	3.10	2.00
		33.7	2.00	1.58	2.27	4.00	2.25
		42.4	2.00	2.02	3.18	4.80	2.75
		48.3	2.00	2.31	3.85	5.45	3.00
		60.3	2.00	2.92	5.41	7.95	4.00
		76.1	2.00	3.70	7.78	12.50	4.25
		88.9	2.00	4.35	10.01	16.25	4.75
		114.3	2.60	7.27	16.62	26.50	5.00
		139.7	2.60	8.92	23.13	34.00	5.00
		168.3	3.20	13.20	34.09	47.75	5.00
		219.1	3.20	17.30	52.83	67.50	5.00
		273.0	3.20	21.60	80.14	96.50	5.00
		323.9	3.20	25.70	108.10	127.25	5.00
		406.4	3.20	32.30	162.02	185.50	5.00
		508.0	3.20	40.40	243.08	268.00	5.00

DN[1]	Pipe outside dia	Wall thickness	Empty	Weight of water-filled pipe	With insulation	Max. rec. distance between supports	
NW	mm	mm	kg/m	kg/m	kg/m	m	
Waste pipe, GA, DIN 19500							
50		60.0	3.50	5.30	7.50	0.60	
70		80.0	3.50	7.10	11.28	0.80	
100		112.0	4.00	10.30	18.79	1.15	
125		137.0	4.00	13.70	26.76	1.35	
150		162.0	5.00	17.30	35.43	1.60	
200		212.0	6.00	32.70	64.10	2.00	
Waste pipe, cast iron (SML, ML)							
40	48.0	3.5	3.00	4.40		approx. 2.00	
50	58.0	3.5	4.30	6.40			
70	78.0	3.5	5.90	9.90		According to	
100	110.0	3.5	8.40	17.70		manufacturer's	
125	135.0	4.0	11.80	24.50		instructions, each	
150	160.0	4.0	14.10	32.30		pipe lenght should	
200	210.0	5.0	23.10	54.60		have <u>at least two</u>	
250	274.0	5.5	33.30	87.70		supports in addition	
300	326.0	6.0	43.20	120.80		to each fitting.	
400	429.0	8.1	75.50	208.80			
500	532.0	9.0	104.30	311.80			
600	635.0	9.9	137.10	434.20			
Waste pipe, PE (Geberit)							
26	32.0	3.0	0.27	0.80		According to manufacturer, 10 x Ø	0.32
34	40.0	3.0	0.34	1.25			0.40
40	50.0	3.0	0.44	1.96			0.50
50	56.0	3.0	0.50	2.46			0.56
60	63.0	3.0	0.56	3.11			0.63
70	75.0	3.0	0.67	4.41			0.75
80	90.0	3.5	0.95	6.36			0.90
100	110.0	4.3	1.43	9.50			1.10
125	125.0	4.9	1.81	12.27			1.25
125	140.0		2.28	15.39			1.40
150	160.0	6.2	3.00	20.10			1.60
200	200.0	6.2	3.83	31.45			2.00
250	250.0	7.8	6.01	49.15			2.50
Waste pipe, PVC-U, hard, as per DDIN 19532 and DIN 8063, series 3						20ºC	40ºC
40	50.0	1.8	0.42	1.94		1.40	1.10
50	63.0	1.9	0.56	3.04		1.50	1.20
65	75.0	2.2	0.78	4.30		1.65	1.35
80	90.0	2.7	1.13	6.19		1.80	1.50
100	110.0	3.2	1.64	10.07		2.00	1.70
125	140.0	3.7	2.13	11.90		2.25	1.95
150	160.0	4.7	3.44	19.47		2.40	2.10
Copper pipe as per EN 1057							
	10.0	1.0	0.25	0.30	0.4	1.00	
	12.0	1.0	0.30	0.38	0.5	1.25	
	15.0	1.0	0.39	0.52	0.8	1.25	
	18.0	1.0	0.47	0.67	1.0	1.50	
	22.0	1.0	0.58	0.90	1.3	2.00	
	28.0	1.5	1.11	1.60	2.4	2.25	
	35.0	1.5	1.42	2.21	3.1	2.75	
	42.0	1.5	1.70	2.89	4.4	3.00	
	54.0	2.0	2.91	4.87	7.3	3.50	
	64.0	2.0	3.47	6.29	9.8	4.00	
	76.1	2.0	4.10	8.20	14.0	4.25	
	88.9	2.0	4.90	10.50	16.4	4.75	
	108.0	2.0	7.40	15.70	27.5	5.00	
	133.0	3.0	10.90	31.50	35.8	5.00	
	159.0	3.0	13.10	31.50	43.5	5.00	

[1] **DN is language-independent abbreviation for "nominal width", used world-wide.**