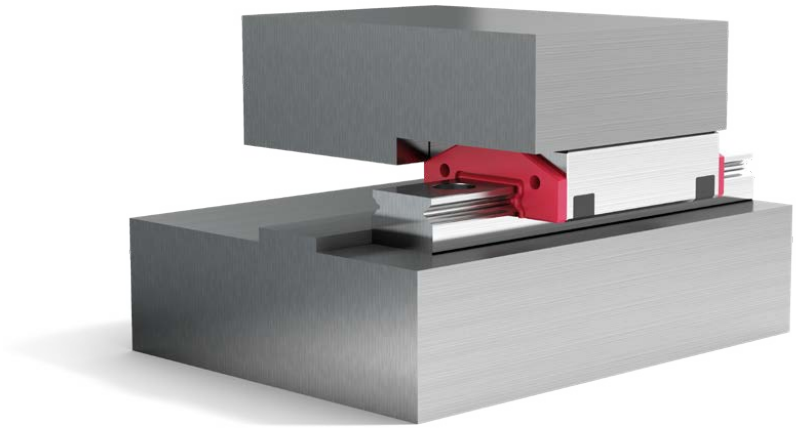
15 Configuration of the Base Structure



15.1 General

MINI-X are high-precision components. Flatness requirements of the base structure are correspondingly high so that surface inaccuracies are not transferred to the guideways.

MINI-X guideways perform best when mounted on a rigid structure with a high level of geometric accuracy. Inaccuracies in the guideway assembly surfaces have a negative impact on their overall accuracy, running behaviour, push force and service life. Unstable assembly surfaces can increase the internal forces within the guideway assembly, which also adversely affects service life. Due to their lower rigidity and limited machining accuracy, great care must be taken when designing base structures made of light metal for high-precision applications.

The guideways are compressed against the mounting surfaces by the attachment screws with a high level of force. To prevent relaxation of the assembly, a high surface contact ratio is required. This is achieved by means of high surface quality.

15.2 Surface Quality

The surface quality of the supporting surface does not have a direct influence on the function and running behaviour of the guideway, but it does on the static position accuracy. Carriages and guide rails are compressed against the mounting surfaces by the attachment screws with a high level of force. To prevent relaxation of the assembly, a high surface contact ratio is required. This is achieved by means of high surface quality.

The accuracy of the application critically determines the required surface quality of the reference and locating surfaces. It is therefore necessary to ensure the following:

- High-precision applications max. Ra value of 0.4
- Standard applications max. Ra value of 1.6

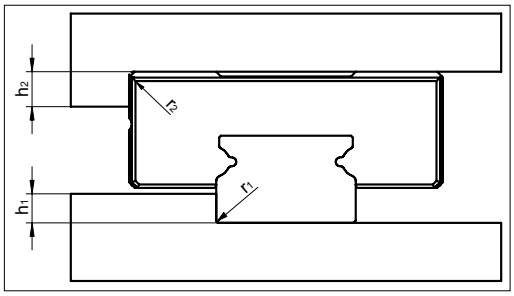
15 Configuration of the Base Structure

15.3 Reference Height and Corner Radii

Observance of the following height specifications for the reference surfaces guarantees secure absorption of force and sufficient clearance for the carriages. The carriages and guide rails feature a chamfer on the edges of the reference surfaces. The corner radii specified in the following tables are maximum values which ensure that carriages and guide rails contact the mounting surfaces correctly.

The reference side of the carriage is opposite the carriage side with the company logo / type designation. The guideway can be located on both sides.

The dimensions listed for the reference surface should be applied to ensure optimal alignment of the guideway and an easy installation.



MINIRAIL and MINISCALE PLUS

Rail size	h_1	r_{1max}	r_{2max}	h_2
7	1.2	0.2	0.3	2.5
9	1.5	0.3	0.4	3
12	2.5	0.4	0.4	4
15	3.5	0.5	0.5	5
14	1.8	0.2	0.4	2
18	3	0.3	0.5	3
24	3.5	0.4	0.5	4
42	3.5	0.5	0.6	5

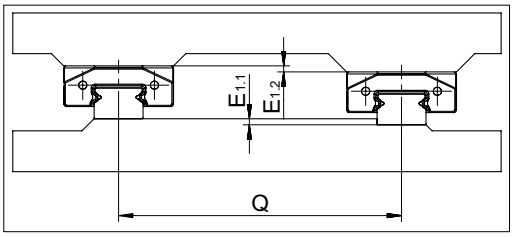
MINISLIDE

Rail size	h_1	r_{1max}	r_{2max}	h_2
4	0.2	0.1	0.1	1.2
5	0.4	0.2	0.1	1.8
7	1.0	0.2	0.3	2.5
9	1.5	0.3	0.4	3
12	2.5	0.4	0.4	4
15	3.0	0.5	0.5	5

15 Configuration of the Base Structure

15.4 Geometric and Position Accuracy of the Base Surfaces

15.4.1 Permissible Lateral Deviation E_1 for MINIRAIL and MINISCALE PLUS



Calculating height deviation E_1

$E_1 = Q \cdot V_{vsp}$

E_1	= height deviation $E_{1.1} + E_{1.2}$ in mm
Q	= guide rail spacing in mm
V_{vsp}	= preload factor (see following table)

	Preload factor V_{vsp}	
Dimension of the carriages	Preload class V0	Preload class V1
7, 9, 12, 15	0.00025 Q	0.00015 Q
14, 18, 24, 42	0.00013 Q	0.00008 Q

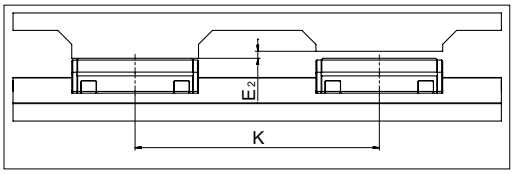
Calculation example for E_1

Example: Type MNN 12 in preload class V1
Spacing Q = 120 mm

Calculation: Type MNN 12 in preload class V1 results in a preload factor V_{vsp} of 0.00015
0.00015 x 120 mm = 0.018 mm

Comment: The deviations of $E_{1.1}$ and $E_{1.2}$ (= E_1) must not exceed 0.018 mm.

15.4.2 Permissible Longitudinal Deviation E_2 for MINIRAIL and MINISCALE PLUS



Calculating height deviation E_2

$E_2 = K \ V_{vsp}$

E_2	= height deviation in mm
Q	= carriage spacing in mm
V_{vsp}	= preload factor (see following table)

Carriage dimensions, type MNNS (short)	Preload factor V_{vsp}
7, 9, 12, 15	0.00010 K
Carriage dimensions, type MNN (standard)	**Preload factor V_{vsp}**
7, 9, 12, 15	0.00005 K
14, 18, 24, 42	0.00004 K
Carriage dimensions, type MNNL (long)	**Preload factor V_{vsp}**
7, 9, 12, 15	0.00004 K
14, 18, 24, 42	0.00003 K
Carriage dimensions, type MNNXL (extra long)	**Preload factor V_{vsp}**
7, 9, 12, 15	0.00003 K

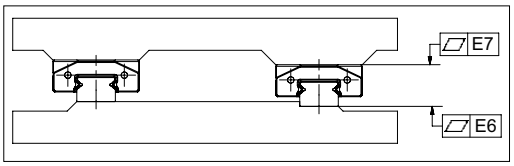
Calculation example for E_2

Example: Type MNNL 42
Spacing K = 700 mm

Calculation: Type MNNL 42 results in a preload factor V_{vsp} of 0.00003
0.00003 x 700 mm = 0.021 mm

Comment: The deviations of E_2 must not exceed 0.021 mm.

15.4.3 Flatness of the Mounting Surfaces E_6 and E_7



For the flatness of the guideway surface E6 across the entire length, referring to the values for running accuracy for the appropriate accuracy class as described in chapter 7.2.4 is recommended.

For the flatness of the carriage surface E7, the values in the table below should be targeted.

MINIRAIL and MINISCALE PLUS

Dimensions	Flatness (in µm)
7	3
9	
12	4
15	
14	
18	
24	5
42	

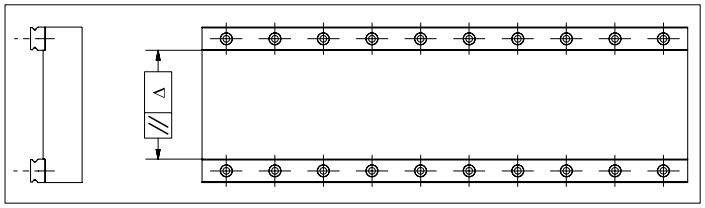
MINISLIDE MS and MSQ

For the flatness of the carriage surface E7, the values in the table below should be targeted.

Dimensions	Flatness (in µm)
4	2
5	
7	3
9	
12	4
15	

15.4.4 Parallelism Tolerance of the Reference Surfaces for MINIRAIL and MINISCALE PLUS

Guide rails which are not aligned in parallel cause unplanned loads in the guide system over its stroke length, subsequently subjecting the tracks to additional stress. This decreases running accuracy of the guideways and can shorten the service life. The parallelism tolerances Δ below must therefore be adhered to.



	Rail widths in mm			
Preload class	7 and 14	9 and 18	12 and 24	15 and 42
V0	Δ 0.003 mm	Δ 0.005 mm	Δ 0.008 mm	Δ 0.010 mm
V1	Δ 0.002 mm	Δ 0.003 mm	Δ 0.004 mm	Δ 0.005 mm