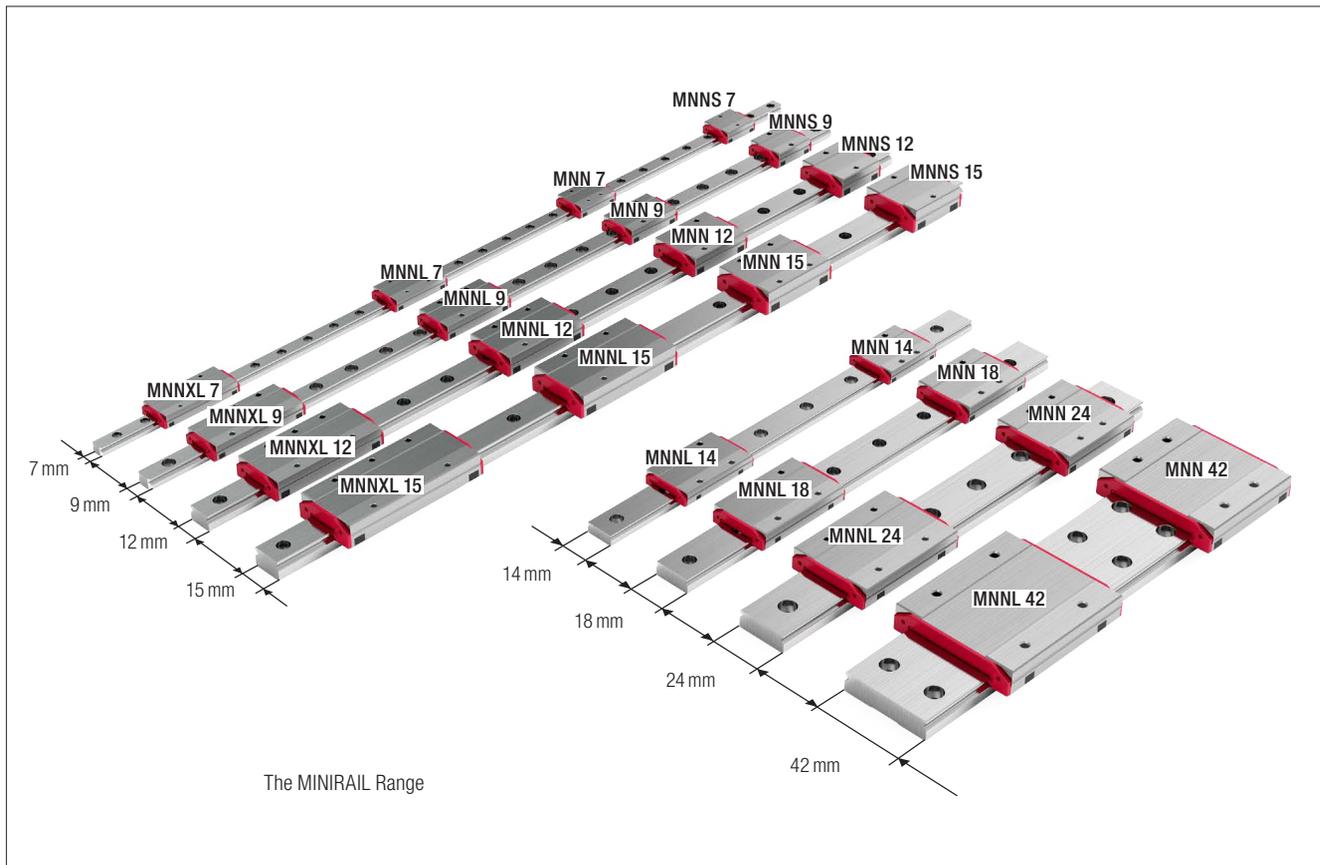


## 7 MINIRAIL Product Overview

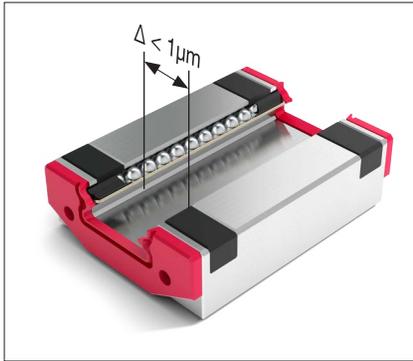
MINIRAIL are highly accurate miniature profiled linear guideways with ball bearings. Their precision, robustness, innovative design and strength are second to none.

The range includes the standard rail widths of 7, 9, 12 and 15 as well as wider widths of 14, 18, 24 and 42. The carriages are available in four lengths: MNNS (short), MNN (standard), MNNL (long) and MNNXL (extra long).



## 7 MINIRAIL Product Overview

### 7.1 Product Characteristics



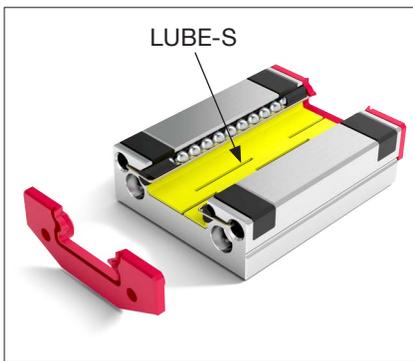
Carriage uniformity system

#### 7.1.1 Carriage Interchangeability

Because the carriages are made to precisely the same size, they can be switched for other carriages at will (carriage uniformity system). This simplifies storage and maintenance considerably.

**Note:**

The MINISCALE PLUS carriages and guideways are always matched to each other and are therefore delivered as a set (carriage mounted on rails) - (see chapter 18.1).



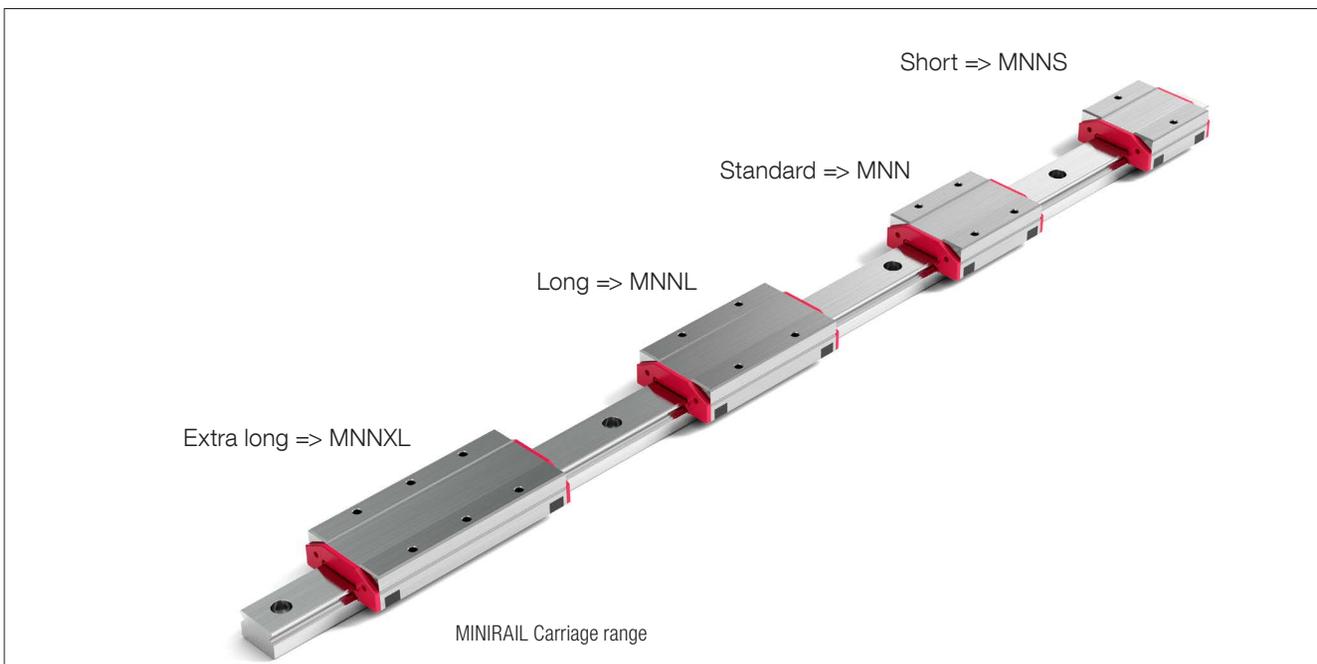
LUBE-S long-term lubrication

#### 7.1.2 LUBE-S Long-term Lubrication from SCHNEEBERGER

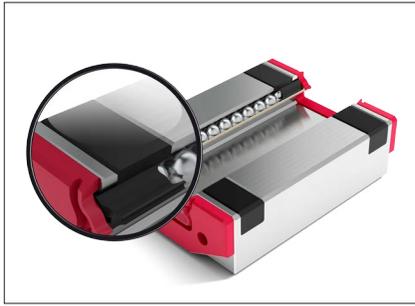
The SCHNEEBERGER solution for long-term lubrication LUBE-S is described in detail in chapter 8.1. LUBE-S enables maintenance-free operation for up to 20,000 km, requires no extra space and is good for the environment and short stroke applications.

#### 7.1.3 The Carriage Range

The different carriage lengths from short to extra long, along with the corresponding load capacities, allow greater flexibility when designing axes of motion.



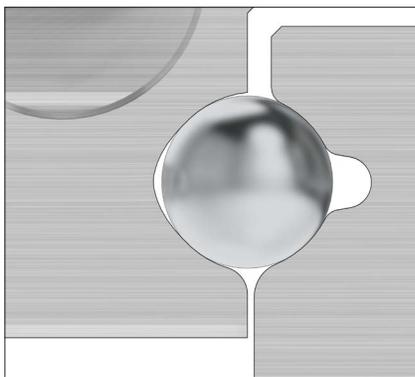
## 7 MINIRAIL Product Overview



Enlargement of ball recirculation in the carriages

### 7.1.4 Speed and Acceleration

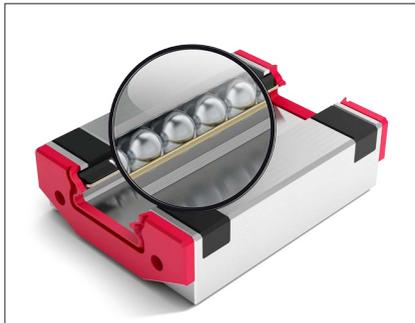
The innovative embedding of ball recirculation in the carriage allows speeds of up to 5 m/s and accelerations of up to 300 m/s<sup>2</sup>.



Gothic arc profile of the guideway tracks

### 7.1.5 High Load Capacities

The Gothic arc profile of the guideway tracks allows high load capacities.



Retaining wire holding the balls in place

### 7.1.6 Simple Installation and Maintenance

Whether a carriage is moving along the guideways or being prepared for installation, the ball bearings are always held in place by a retaining wire. This makes for easier handling and is a prerequisite for simple installation and replacement carriages.

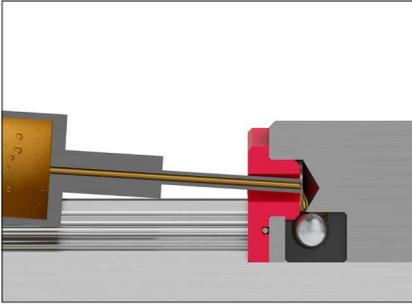


Made of corrosion-resistant, through-hardened steel

### 7.1.7 Exceptional Robustness

Carriages and guideways are made of through-hardened stainless steel. They are therefore superbly suited for use in the most demanding of applications.

## 7 MINIRAIL Product Overview



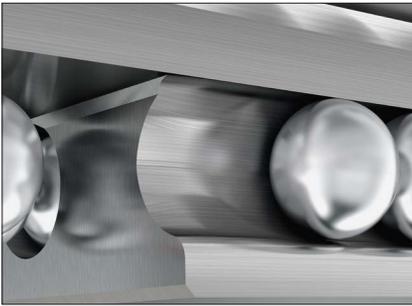
MINIRAIL lubrication with oil

### 7.1.8 Sophisticated Lubrication Concept

MINIRAIL are delivered unlubricated as standard, allowing you to decide on the optimal lubrication for the respective application (see chapter 7.2.12 «Lubricating MINIRAIL»).

Each wiper on the carriages features two lubrication holes so that the left and right ball recirculation pathways can be lubricated with oil separately. This ensures that the tracks of the carriage can be supplied with lubricant independent of their installation orientation.

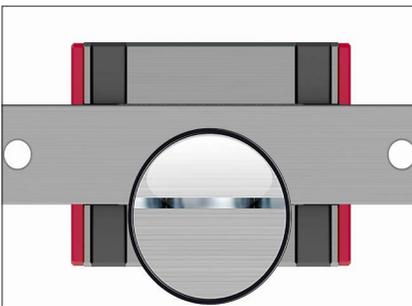
Also consider the long-term lubrication option LUBE-S in chapter 8.1.



Polished run-ins

### 7.1.9 Excellent Running Properties

The ball recirculation, transitions and run-ins on the carriages are designed for consistent redirection of the ball bearings. They ensure optimal containment of the enormous centrifugal forces involved with minimal friction.

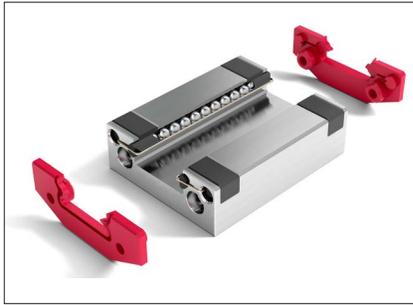


Small clearances between carriages and guideways

### 7.1.10 Maximum Protection from Contamination

The ultra-precise manufacturing of the carriages and guideways ensures minimal clearance between them. This prevents the migration of dirt particles into carriages.

## 7 MINIRAIL Product Overview



Detachable wipers

The carriages are fitted with profiled wipers as standard. They are snap-fitted into place and can therefore be easily replaced. Alternative variants (for example low-friction or clearance wipers) are described in chapter 9.2.



Plastic plugs for sealing

In order to prevent the accumulation of dirt, the attachment holes in the guideways can be sealed with plastic plugs (see chapter 9.1).

## 7 MINIRAIL Product Overview

### 7.2 Technical Information and Alternative Variants

#### 7.2.1 MINIRAIL Performance Parameters

<b>Max. acceleration</b>	300 m/s <sup>2</sup>
<b>Max. speed</b>	5 m/s
<b>Preload classes</b>	V0 light preload up to 0.01 C (C = dynamic load capacity)
	V1 Preload 0 to 0.03 C (C = dynamic load capacity)
<b>Accuracy classes</b>	G1 and G3
<b>Materials</b>	
- guideways, carriages, ball bearings	Stainless steel, through-hardened
- wiper <sup>(2)</sup>	TPC
- ball recirculation	POM
<b>Areas of application</b>	
- temperature range <sup>(1)</sup>	-40° C to +80° C (-40° F to +176° F)
- vacuum <sup>(2)</sup>	vacuum (max. 10 <sup>-7</sup> mbar)
- humidity	10 % – 70 % (non-condensing)
- cleanroom	Cleanroom class ISO 7 or ISO 6 (in accordance with ISO 14644-1)

<sup>(1)</sup> With modified ball recirculation made of PEEK, temperatures up to +150° C (+302° F) are possible (on request). The standard lubricant covers a temperature range from -20° C to +100° C. SCHNEEBERGER also accepts requests for lubricants for other temperatures.

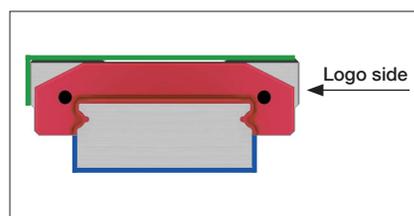
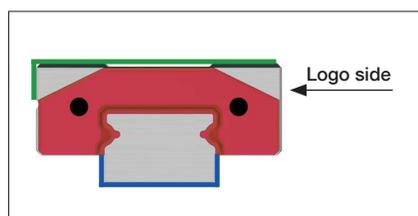
<sup>(2)</sup> For use in high vacuum, the wipers on the carriages must be removed. MINIRAIL with modified ball recirculation made of PEEK can also be operated in a vacuum (up to 10<sup>-9</sup> mbar) on request. Use in a vacuum requires a special lubricant available from SCHNEEBERGER. So that no air remains trapped in the blind holes, the fastening screws must be vented.

#### 7.2.2 Reference and Supporting Surfaces

The reference and supporting surfaces of carriages and guideways are designated as follows.

Standard sizes 7, 9, 12 and 15

Wider widths 14, 18, 24 and 42



- Carriage reference and supporting surfaces
- Guideway reference and supporting surfaces

The polished reference side of the carriage is opposite the carriage side with the company logo / type designation. Either side of the guideway can be used as a reference side.

## 7 MINIRAIL Product Overview

### 7.2.3 Accuracy Classes

MINIRAIL carriages and guide rails are made to a high precision independently of each other. The carriages are interchangeable. This means that any carriage of the same size and accuracy class can be used on the guide rails without influencing the preload class.

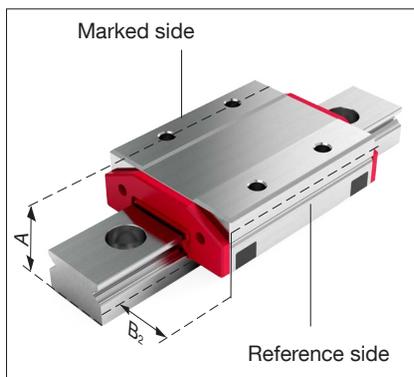
MINISCALE PLUS carriages and guide rails are also made to a high precision. Due to the integrated linear encoder, the carriage and guideway are matched together and therefore can only be changed as a set.

Both G1 and G3 accuracy classes offer a precise MINIRAIL range suited to the application-specific needs of the customer. The accuracy classes determine the size tolerances and the running accuracy of the carriages on the guideways:

High accuracy G1  
Standard accuracy G3

**Note:**

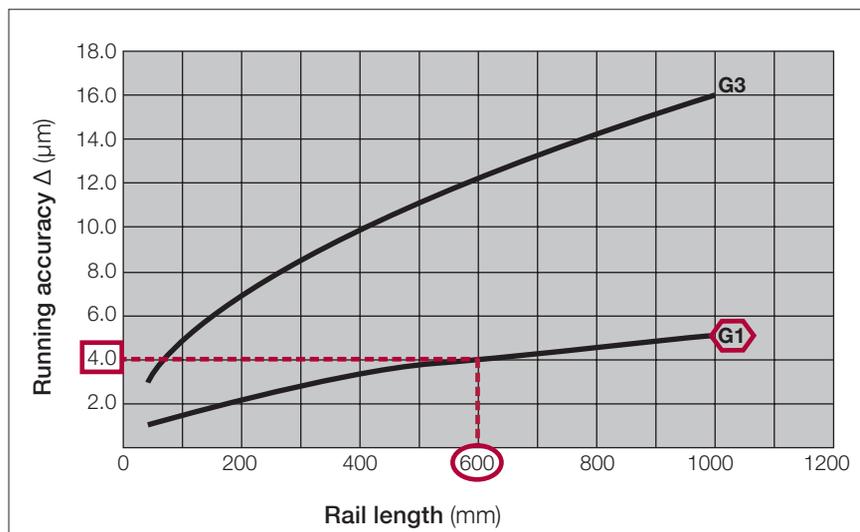
MINIRAIL are available in accuracy classes G1 and G3  
MINISCALE PLUS are always delivered in accuracy class G1.



Tolerances		
	A and B2	$\Delta A$ and $\Delta B2$
Accuracy class G1	+/- 10 $\mu\text{m}$	7 $\mu\text{m}$
Accuracy class G3	+/- 20 $\mu\text{m}$	15 $\mu\text{m}$
	Measured relative to carriage centre	Difference in measurement between several carriages on the same position on the rails
For the measurements mentioned above, the guideway is mounted on a flat surface. Measurement is taken from the middle of the carriage. Since the measurement is stable, it is based on the midpoint of the two supporting surfaces		

### 7.2.4 Running Accuracy

In terms of tolerances, the running of the carriage on a guideway can take on either a linear or wave-like shape. The maximum permissible deviation is limited by the accuracy class of the guideway. As shown on the following diagram, the tolerance is determined by the rail length and by accuracy class G1 or G3.



Example according to the diagram:

A rail length of 600 mm and accuracy class G1 results in a maximum permissible deviation of 4.0 µm

### 7.2.5 Preload Classes

The preload classes are defined as a fraction of the dynamic load capacity C (see chapter 17). The amount of preload is generally based on the intended use of the guideways.

An increased preload ...

- ... increases the rigidity
- ... increases the displacement resistance
- ... reduces the service life

Preload class	Preload	corresponding accuracy class
V0	light preload up to 0.01 • C	G3
V1	0 to 0.03 • C	G1 or G3

### 7.2.6 Push Force

The push force of the carriage is influenced by the preload class, the lubricant and the wipers used.

The carriages can be delivered with a defined push force on request (see chapter 8.3).

### 7.2.7 Friction and Smoothness

SCHNEEBERGER places high emphasis on running smoothness during the manufacturing process. Transitions, run-ins and run-outs and the quality of the plastics are given top priority. This also applies in respect of the rolling elements used, which must satisfy the most stringent quality demands. Under normal operating conditions, a coefficient of friction of 0.005 can be expected (without wipers).

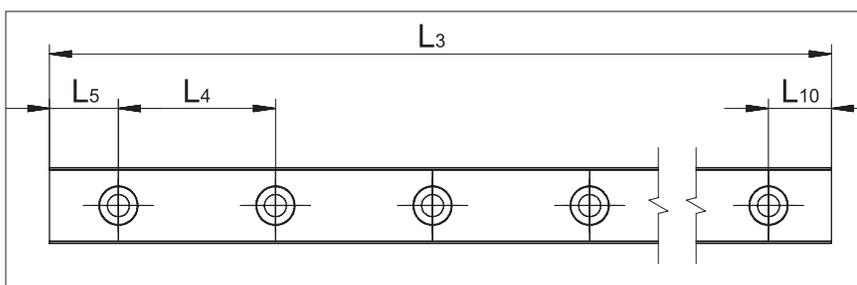
### 7.2.8 Carriage Uniformity System

The MINIRAIL carriages are interchangeable within preload and accuracy classes. With this in mind, guideways and carriages are packaged separately (see chapter 18.1). This simplifies interchangeability and storage.

## 7 MINIRAIL Product Overview

### 7.2.9 Rail Length and Hole Spacings

Sizes	L <sub>4</sub>	L <sub>5</sub> and L <sub>10</sub>	Rail lengths L <sub>3</sub> ...	... max.
7	15	5	40, 55, 70, 85 ...	...1000
9	20	7.5	55, 75, 95, 115 ...	... 995
12	25	10	70, 95, 120, 145 ...	... 995
15	40	15	70, 110, 150, 190 ...	... 990
14	30	10	80, 110, 140, 170 ...	... 980
18	30	10	80, 110, 140, 170 ...	... 990
24	40	15	110, 150, 190, 230 ...	... 990
42	40	15	110, 150, 190, 230 ...	... 990



L<sub>3</sub> = standard rail lengths in mm  
L<sub>4</sub>, L<sub>5</sub>, L<sub>10</sub> = standard hole spacings in mm

#### Calculating rail lengths that do not correspond to the standard

Individual rail lengths can be calculated with the following formula (up to a maximum rail length according to the above table):

$$L_3 = (n-1) \cdot L_4 + L_5 + L_{10}$$

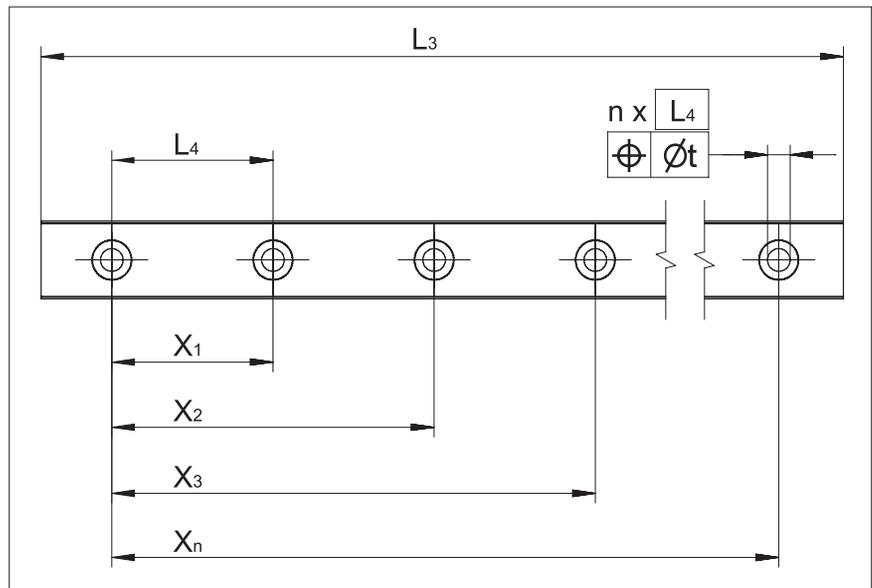
L<sub>3</sub> = rail length in mm  
L<sub>4</sub>, L<sub>5</sub>, L<sub>10</sub> = individual hole spacing in mm  
L<sub>4</sub> = standard hole spacings in mm  
n = number of attachment holes

For hole spacings L<sub>5</sub> and L<sub>10</sub>, the following values are applicable:

		Rail length							
		7	9	12	15	14	18	24	42
L <sub>5</sub> and L <sub>10</sub> (in mm)	min.	4	5	5	5	5	5	6	6
	max.	11	15	20	35	25	25	34	34

7 MINIRAIL Product Overview

Position tolerance of the attachment holes and tolerances of the rail length

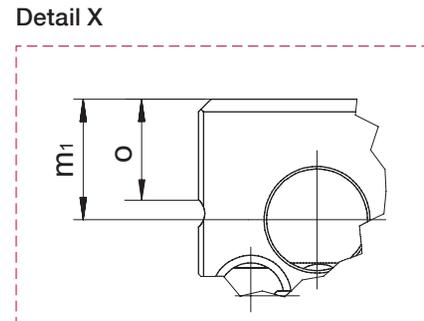
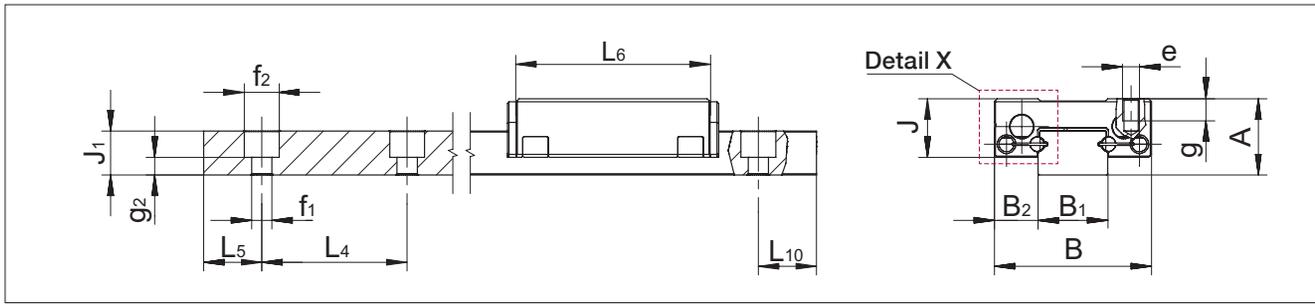


$L_3$  = rail length in mm  
 $L_4$  = hole spacing in mm  
 $n$  = number of attachment holes  
 $t$  = position tolerance in mm

	$L_3 \leq 300$ mm	$L_3 > 300$ mm
Position tolerance $t$ of the attachment hole	0.3	$0.001 \cdot X_n$
Tolerance of the rail length $L_3$	$\pm 0.3$	$\pm 0.001 \cdot L_3$

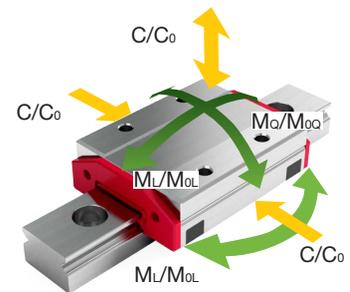
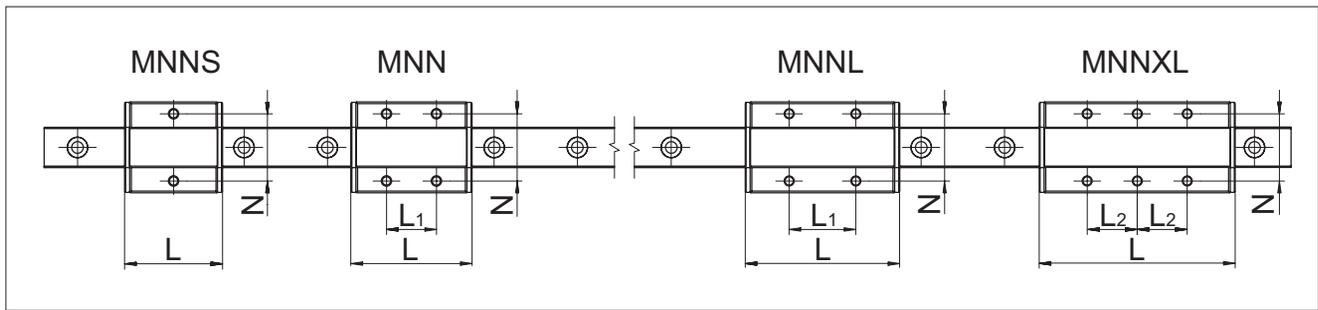
## 7 MINIRAIL Product Overview

### 7.2.10 Dimension Tables, Load Capacities and Moment Loads for Standard Sized MINIRAIL



		Name	Standard size 7				Standard size 9					
			Guideway	MNNS	MNN	MNNL	MNNXL	Guideway	MNNS	MNN	MNNL	MNNXL
Dimensions (mm)	A	System height	8				10					
	B	System width	17				20					
	B <sub>1</sub>	Rail width	7				9					
	B <sub>2</sub>	Distance between reference surfaces	5				5.5					
	J	Carriage height	6.5				8					
	J <sub>1</sub>	Rail height	4.5				5.5					
	L	Carriage length with wipers	18.6 24.6 32.1 41.1				22 32 40 50					
	L <sub>1</sub>	Longitudinal spacing of attachment holes	- 8 13 20				- 10 16 26					
	L <sub>2</sub>	Longitudinal spacing of attachment holes	- - - 10				- - - 13					
	L <sub>4</sub>	Spacing of attachment holes	15				20					
	L <sub>5</sub> /L <sub>10</sub>	Position of first and last attachment hole	5				7.5					
	L <sub>6</sub>	Carriage length (steel body)	16.1 22.1 29.6 38.6				19 29 37 47					
	N	Lateral attachment hole spacing	12				15					
	e	Thread	M2				M3					
	f <sub>1</sub>	Hole diameter	2.4				3.5					
	f <sub>2</sub>	Countersink diameter	4.2				6					
g	Thread depth	2.5				3						
g <sub>2</sub>	Step drilling height	2.2				2						
m <sub>1</sub>	Position of lubrication holes	3.1				3.8						
o	Reference face height	2.5				3.1						
Load capacity (N)	C <sub>0</sub>	Static load capacity	935	1560	2340	3275	1385	2770	3880	5270		
	C	Dynamic load capacity	645	925	1230	1550	1040	1690	2140	2645		
Torque (Nm)	M <sub>0c</sub>	Permissible lateral static torque	3.4	5.6	8.4	11.8	6.5	12.9	18.1	24.5		
	M <sub>0L</sub>	Permissible longitudinal static torque	1.6	4.3	9.3	18	2.8	10.2	19.4	35.1		
	M <sub>0d</sub>	Permissible lateral dynamic torque	2.3	3.3	4.4	5.6	4.8	7.9	9.9	12.3		
	M <sub>0Ld</sub>	Permissible longitudinal dynamic torque	1.1	2.5	4.9	8.5	2.1	6.2	10.7	17.6		
Weights guideway (g/m), carriage (g)			216	9	13	18	23	309	16	24	31	40

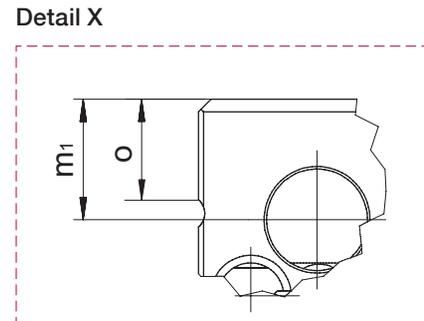
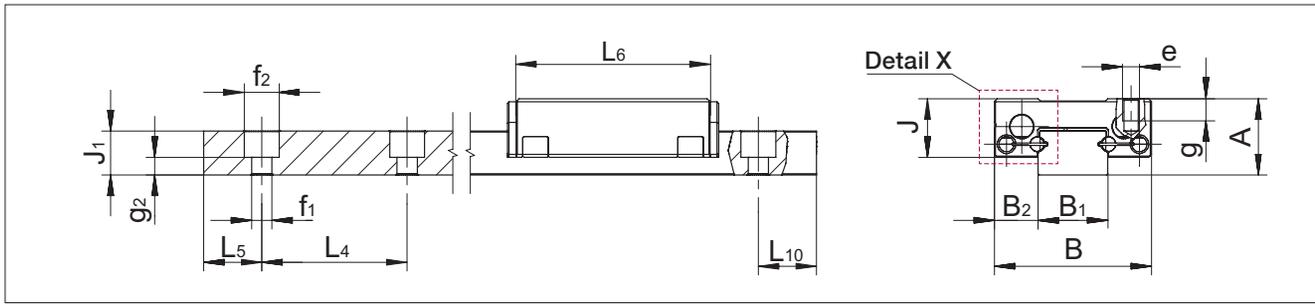
## 7 MINIRAIL Product Overview



		Name	Standard size 12				Standard size 15					
			Guideway	MNNS	MNN	MNNL	MNNXL	Guideway	MNNS	MNN	MNNL	MNNXL
Dimensions (mm)	A	System height	13				16					
	B	System width	27				32					
	B <sub>1</sub>	Rail width	12					15				
	B <sub>2</sub>	Distance between reference surfaces	7.5				8.5					
	J	Carriage height	10				12					
	J <sub>1</sub>	Rail height	7.5					9.5				
	L	Carriage length with wipers		23.9	36.4	46.4	58.9		31.7	43.7	58.7	73.7
	L <sub>1</sub>	Longitudinal spacing of attachment holes		-	15	20	30		-	20	25	40
	L <sub>2</sub>	Longitudinal spacing of attachment holes		-	-	-	15		-	-	-	20
	L <sub>4</sub>	Spacing of attachment holes	25					40				
	L <sub>5/L<sub>10</sub></sub>	Position of first and last attachment hole	10					15				
	L <sub>6</sub>	Carriage length (steel body)		20.9	33.4	43.4	55.9		28.7	40.7	55.7	70.7
	N	Lateral attachment hole spacing		20					25			
	e	Thread		M3					M3			
	f <sub>1</sub>	Hole diameter	3.5					3.5				
	f <sub>2</sub>	Countersink diameter	6					6				
	g	Thread depth		3.5					4			
g <sub>2</sub>	Step drilling height	3					5					
m <sub>1</sub>	Position of lubrication holes		4.75					5.55				
o	Reference face height		3.9					4.9				
Load capacity (N)	C <sub>0</sub>	Static load capacity	1735	3900	5630	7800	3120	5620	8740	11855		
	C	Dynamic load capacity	1420	2510	3240	4070	2435	3680	5000	6200		
Torque (Nm)	M <sub>00</sub>	Permissible lateral static torque	10.6	23.8	34.4	47.6	23.7	42.7	66.4	90.1		
	M <sub>0L</sub>	Permissible longitudinal static torque	3.6	16.3	32.9	61.8	9.4	28.1	65.5	118.6		
	M <sub>0</sub>	Permissible lateral dynamic torque	8.7	15.3	19.8	24.8	18.5	27.9	38.1	47.1		
	M <sub>L</sub>	Permissible longitudinal dynamic torque	3	10.4	18.9	32.2	7.3	18.4	37.6	62		
Weights		guideway (g/m), carriage (g)	598	29	47	63	81	996	56	81	114	146

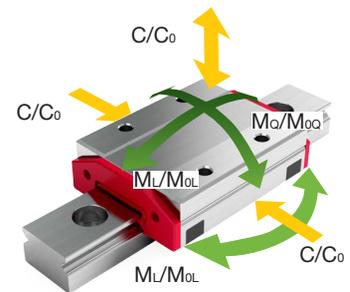
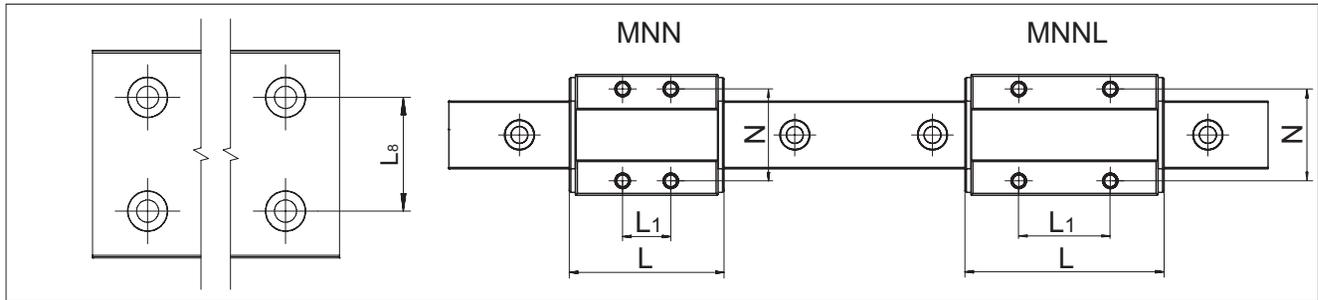
## 7 MINIRAIL Product Overview

### 7.2.11 Dimension Tables, Load Capacities, and Moment Loads, for Wider Width MINIRAIL



Name		Wider width 14			Wider width 18		
		Guideway	MNN	MNNL	Guideway	MNN	MNNL
Dimensions (mm)	A	System height		9		12	
	B	System width		25		30	
	B <sub>1</sub>	14	Rail width		18	30	
	B <sub>2</sub>	Distance between reference surfaces		5.5		6	
	J	Carriage height		6.8		8.5	
	J <sub>1</sub>	5.2	Rail height		7	8.5	
	L	Carriage length with wipers		32.1	41.1	40	50
	L <sub>1</sub>	Longitudinal spacing of attachment holes		10	19	12	24
	L <sub>2</sub>	Longitudinal spacing of attachment holes		-	-	-	-
	L <sub>4</sub>	30	Spacing of attachment holes		30	30	
	L <sub>5</sub> /L <sub>10</sub>	10	Position of first and last attachment hole		10	10	
	L <sub>6</sub>	Carriage length (steel body)		29.6	38.6	37	47
	L <sub>8</sub>	Lateral attachment hole spacing		-		-	
	N	Lateral attachment hole spacing		19		21	
	e	Thread		M3		M3	
	f <sub>1</sub>	3.5	Hole diameter		3.5	3.5	
	f <sub>2</sub>	6	Countersink diameter		6	6	
g	Thread depth		2.8		3		
g <sub>2</sub>	2	Step drilling height		2.5	2.5		
m <sub>1</sub>	Position of lubrication holes		3.3		4.3		
o	Reference face height		2.2		3.1		
Load capacity (N)	C <sub>0</sub>	Static load capacity		2340	3275	3880	5270
	C	Dynamic load capacity		1230	1550	2140	2645
Torque (Nm)	M <sub>0L</sub>	Permissible lateral static torque		16.6	23.3	35.5	48.2
	M <sub>0L</sub>	Permissible longitudinal static torque		9.3	18	19.4	35.1
	M <sub>0</sub>	Permissible lateral dynamic torque		8.7	11	19.6	24.2
	M <sub>L</sub>	Permissible longitudinal dynamic torque		4.9	8.5	10.7	17.6
Weights guideway (g/m), carriage (g)		518	25	33	915	47	60

## 7 MINIRAIL Product Overview



		Wider width 24			Wider width 42		
		Guideway	MNN	MNNL	Guideway	MNN	MNNL
Dimensions (mm)	A	System height		14		16	
	B	System width		40		60	
	B <sub>1</sub>	24	Rail width		42	60	
	B <sub>2</sub>	Distance between reference surfaces		8		9	
	J	Carriage height		10		12	
	J <sub>1</sub>	Rail height		8.5		9.5	
	L	Carriage length with wipers		46.4	58.9	55.7	73.7
	L <sub>1</sub>	Longitudinal spacing of attachment holes		15	28	20	35
	L <sub>2</sub>	Longitudinal spacing of attachment holes		-	-	-	-
	L <sub>4</sub>	Spacing of attachment holes		40		40	
	L <sub>5</sub> /L <sub>10</sub>	Position of first and last attachment hole		15		15	
	L <sub>6</sub>	Carriage length (steel body)		43.4	55.9	52.7	70.7
	L <sub>8</sub>	Lateral attachment hole spacing		-		23	
	N	Lateral attachment hole spacing		28		45	
	e	Thread		M3		M4	
	f <sub>1</sub>	Hole diameter		4.5		4.5	
	f <sub>2</sub>	Countersink diameter		8		8	
	g	Thread depth		3.5		4.5	
	g <sub>2</sub>	Step drilling height		4		5	
m <sub>1</sub>	Position of lubrication holes		4.75		5.5		
o	Reference face height		3.9		4.9		
Load capacity (N)	C <sub>0</sub>	Static load capacity		5630	7800	8110	11855
	C	Dynamic load capacity		3240	4070	4750	6200
Torque (Nm)	M <sub>0o</sub>	Permissible lateral static torque		68.2	94.4	171.2	250.2
	M <sub>0L</sub>	Permissible longitudinal static torque		32.9	61.8	56.8	118.6
	M <sub>o</sub>	Permissible lateral dynamic torque		39.2	49.3	100.3	130.8
	M <sub>L</sub>	Permissible longitudinal dynamic torque		18.9	32.2	33.3	62
Weights guideway (g/m), carriage (g)		1476	84	109	2828	169	231

### 7.2.12 Lubrication

#### General

Choice of lubricant is an important consideration and must therefore be defined during the development phase of the machine or application. From experience, choosing the lubricant after the design is finalized leads to significant difficulties later on. A carefully thought out lubrication concept is therefore a feature of a state-of-the-art and well-planned design.

Parameters to be taken into account in selecting the lubricant include:

- Operating conditions (Speed, acceleration, stroke, load, installation orientation)
- External influences (Temperature, aggressive media or radiation, contamination, humidity, vacuum, cleanroom)
- Relubrication (Period of time, amount, compatibility)
- Compatibility (With other lubricants, with corrosion protection and with integrated materials such as plastic)

Technical and economic considerations determine the lubricant used.

The guideways should be kept free of cutting oils or water-soluble coolants and lubricants as they thin or wash off the lubricant. In addition, coolants tend to become sticky as they dry out. Lubricants with solid additives are not suitable.

#### Long-term lubrication

The long-term lubrication LUBE-S from SCHNEEBERGER is covered in chapter 8.1.

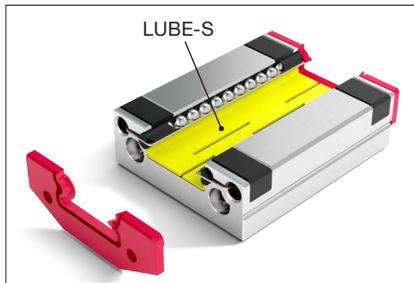
#### Custom lubricants

Specific lubricants are used for specific purposes. For example lubricants for use in vacuums, cleanrooms, for high or low temperatures, for high speeds or high-frequency strokes. SCHNEEBERGER can supply the guideways with the appropriate lubricant for all of these applications.

**Additional important information about lubricants is available in chapter 16.3.3.**

## 8 MINIRAIL Options

### 8.1 LUBE-S (LS) Long-term Lubrication

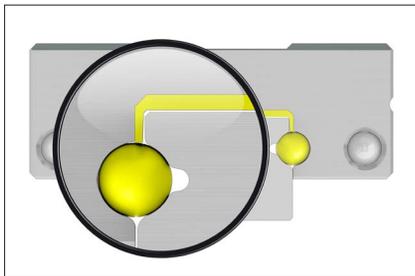


LUBE-S is integrated in the carriage and easily replaceable

All types of MNN MINIRAIL carriages can be ordered with optional LUBE-S lubricant. Other carriage types available on request.

The ingenious long-term lubrication LUBE-S is a lubricant reservoir. It applies the lubricant externally in all orientations directly to the ball recirculation tracks by means of the capillary effect. LUBE-S is integrated into the inside of the carriage and lubricates all ball bearings that are directly under load. LUBE-S ensures lubrication even during short-stroke applications (see chapter 6.6.2).

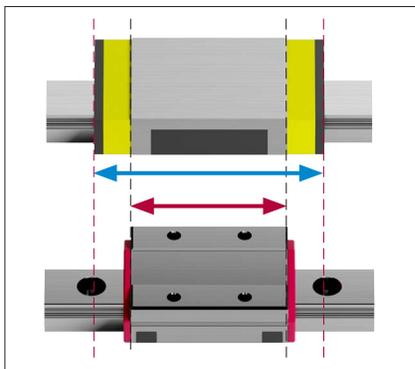
Carriages equipped with LUBE-S are delivered with clearance wipers (see chapter 9.2.1).



LUBE-S applies lubricant to all ball bearings directly under load

#### Using the long-term lubrication LUBE-S:

- Maintenance-free for 20,000 km under normal environmental conditions and the corresponding load
- The carriage length remains unchanged and does not affect the maximum stroke
- LUBE-S is the optimal lubricant for all short-stroke applications
- LUBE-S lubricates the ball bearings which are directly under load
- The smoothness, push force and service life are maintained long-term thanks to LUBE-S
- Maintenance costs are reduced substantially
- The minimal consumption of lubricant is good for the environment
- LUBE-S can be easily replaced



The carriage length remains unchanged with LUBE-S  
The travel distances are therefore not affected

#### A compact solution

The external dimensions of the carriages remain the same. The maximum stroke is therefore not affected.

#### Smoothness

The LUBE-S oil reservoir contacts the ball bearings at a single point. The push forces of the carriages are therefore not affected and the smoothness of the MINIRAIL system is maintained at a high level.



The MINIRAIL guideways should be lubricated during installation. (see also chapter 16.3.3).

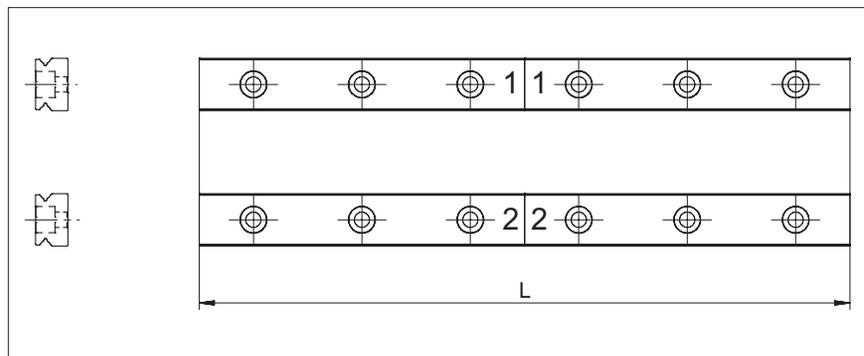
## 8 MINIRAIL Options

### 8.2 Multi-part Guideways for MINIRAIL (ZG)

If the desired total length of the guideway is longer than the maximum length listed in the catalogue, individual guideways can be joined together with precision butt joints. For this configuration, the ends of the guideways are precision ground. The offset between the individual guideways should not exceed 0.002 mm.



Take note of the numbered guideways at the butt joints during installation.



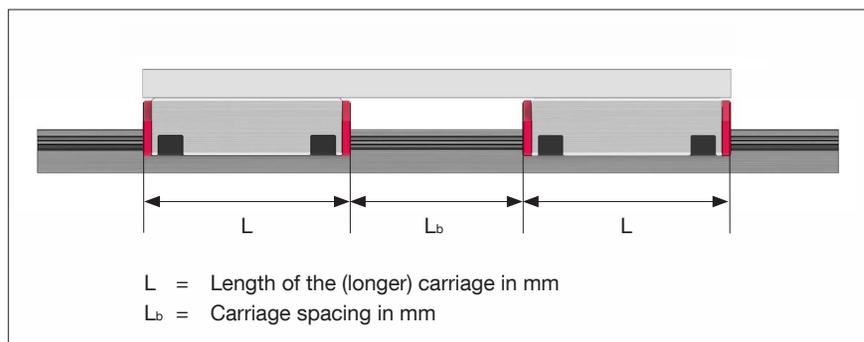
Multi-part guideways are numbered at the butt joint

### 8.3 Push Force Defined (VD)

Demanding applications may only be possible if the guideway has a defined push force. These parameters can be defined by SCHNEEBERGER according to customer specifications. Carriages and guideways are then matched and delivered as a set.

### 8.4 Height-matched Carriages (HA)

In accuracy class G1, the maximum height deviation of the carriages is  $\pm 10 \mu\text{m}$ . This tolerance can be too large for certain configurations, for example when the distances among the individual carriages are too small, i.e. when the carriage spacing  $L_b$  is smaller than the carriage length  $L$ . In such cases, the tolerances can be reduced on a customer-specific basis.



## 8 MINIRAIL Options

### 8.5 Customer-specific Lubrication (KB)

The fundamentals of lubrication are described in chapter 12. Special lubricants are used for specific purposes. For example lubricants for use with vacuums, different temperatures, high speeds, heavy loads or high stroke frequencies.

SCHNEEBERGER can supply the guideways with the appropriate lubricant for all of these applications.



### 8.6 Cleaned and Vacuum-packed (US)

Guideways operated in a vacuum must be cleaned and packaged accordingly. Cleaning takes place in our cleanroom. The packaging consists of an inner, airtight layer and an outer protective layer.

Please state your required cleanroom class (ISO 7 or ISO 6) when making enquiries.



MINIRAIL cleaned and vacuum-packed

## 9 MINIRAIL Accessories

### 9.1 Plastic Plugs (MNK)

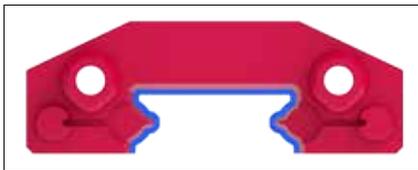


Plastic plugs for sealing the attachment holes

Plastic plugs in the guideway attachment holes prevent accumulations of dirt.

Rail length	Plastic plugs	The plastic plugs can be used with the following types of screws	
		Type	DIN 7984
7	MNK 4	-	x
9	MNK 6	-	x
12	MNK 6	x	x
15	MNK 6	x	x
14	MNK 6	-	x
18	MNK 6	x	x
24	MNK 8	x	x
42	MNK 8	x	x

### 9.2 Wipers (AS, AL and OA)



Standard wiper (blue contour = contact surface)

#### 9.2.1 Standard

The wiper brushes across guideway surfaces and tracks and provides optimal protection against contamination.

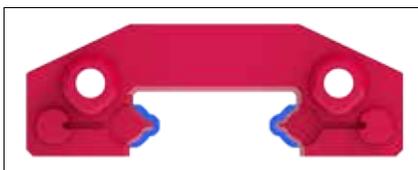


Clearance wiper (AS)

#### 9.2.2 Alternatives

##### Clearance wiper (AS)

These precisely finished clearance wipers prevent the migration of dirt particles without affecting the push force of the carriage. The AS wiper is used as standard for the LUBE-S option (see chapter 8.1).



Smooth-running wiper (AL) (blue contour = contact surface)

##### Smooth-running wiper (AL)

A compromise between the standard wiper and the type AS clearance wiper. Cleans the tracks and seals off the guideway surfaces by means of a gap. Only for sizes 7, 9, 12 and 15.

##### Without wipers (OA)

Without wipers; for use in vacuums, among other applications

### 9.3 Relubrication Set (MNW)

A relubrication set with KLÜBER Structovis GHD allows the MINIRAIL carriages to be lubricated via the two lubrication holes in the wipers.



Relubrication set (MNW), contents 7 ml