ROLLON®

BY TIMKEN

NEW

TO SUPPORT YOU,
WE DESIGN AND PRODUCE

An industrialized process with various levels
of customization

For over 45 years, Rollon has adopted an approach entailing responsibility and ethics in the design and production of our linear motion solutions for different industrial sectors. The reliability of an international technology group has now been combined with the availability of a local support and service network
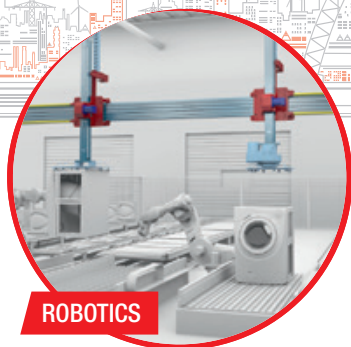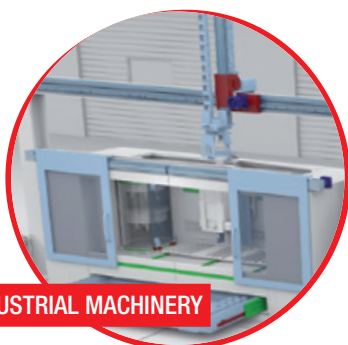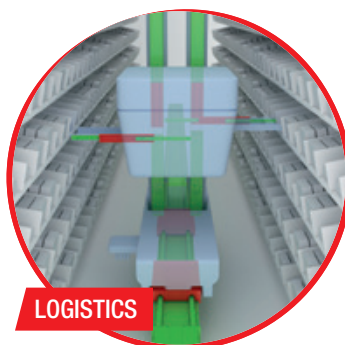
VALUES

Rollon's goal is to help our clients become more competitive in their markets through technological solutions, design simplification, productivity, reliability, duration, and low maintenance.
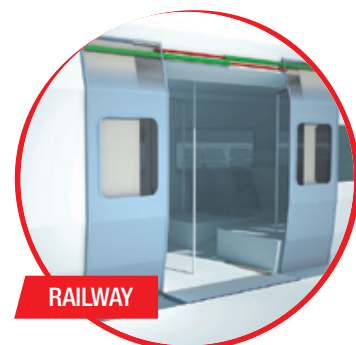
PERFORMANCE

ROBOTICS

INDUSTRIAL MACHINERY

LOGISTICS

RAILWAY

COLLABORATION

High-level technical consulting and cross-competence allow us to identify the needs of our clients and transform them into guidelines for continuous exchange, while**our strong specialization in the different industrial sectors becomes an factor in developing projects and innovative applications.**
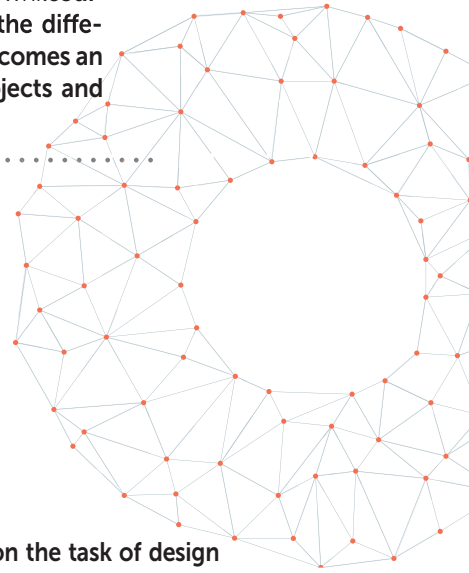
Rollon takes on the task of design and development of linear motion solutions, taking care of everything for our customers, so that they can concentrate on their core business. **We offer everything from individual components to specifically designed, mechanically integrated systems: the quality of our applications is an expression of our technology and competence.**

SOLUTIONS APPLICATIONS
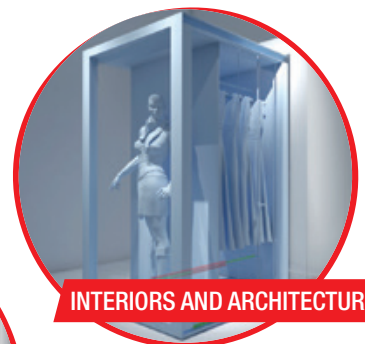
INTERIORS AND ARCHITECTURE
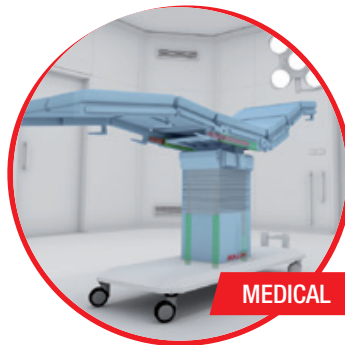
MEDICAL

SPECIAL VEHICLES

AERONAUTICS

DIVERSIFIED LINEAR SOLUTIONS
FOR EVERY APPLICATION REQUIREMENT

Linear and telescopic rails

Linear Line

**Linear and curved rails with ball and roller bearings,** with hardened raceways, high load capacity, self-alignment, and capable of working in dirty environments.

Telescopic Line

Telescopic rails with ball and roller bearings, with hardened raceways, high load capacities, low bending, resistant to shocks and vibrations. For partial, total or extended extraction up to 200% of the length of the guide.

Linear actuators and automation systems
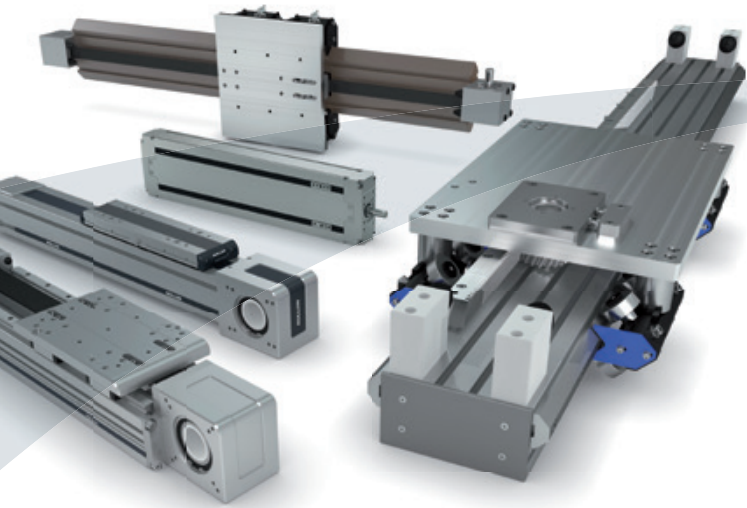
Actuator Line

Linear actuators with different rail configurations and transmissions, available with belt, screw, or rack and pinion drives for different needs in terms of precision and speed. Rails with bearings or ball recycle systems for different load capacities and critical environments.
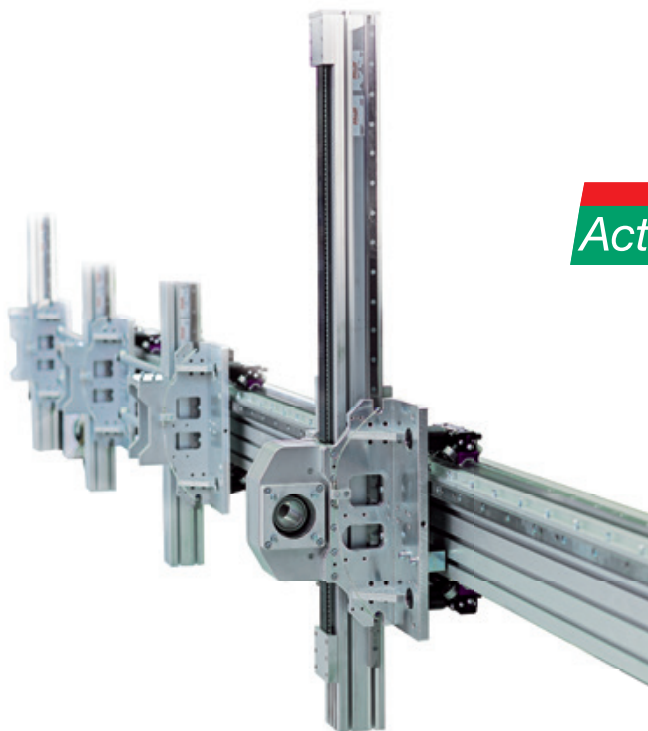
Actuator System Line

Integrated actuators for industrial automation, used in applications in several industrial sectors: automated industrial machinery, precision assembly lines, packaging lines and high speed production lines. The Actuator Line evolves to satisfy the requests of our most discerning clients.

MiniRoller Rail

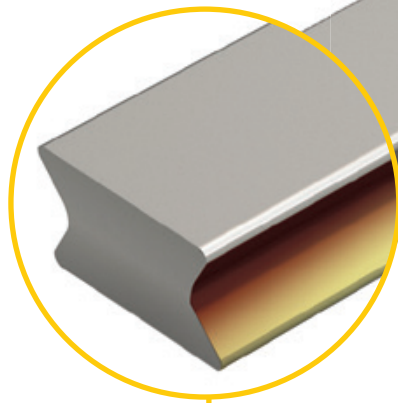An alternative to miniature ball guide in several industries and applications: **7 main advantages**.

1

Space saving

Thin slider and rail make MiniRoller a very compact solution.
Height: 13mm, Width: 35mm

20 mm

15 mm

13 mm
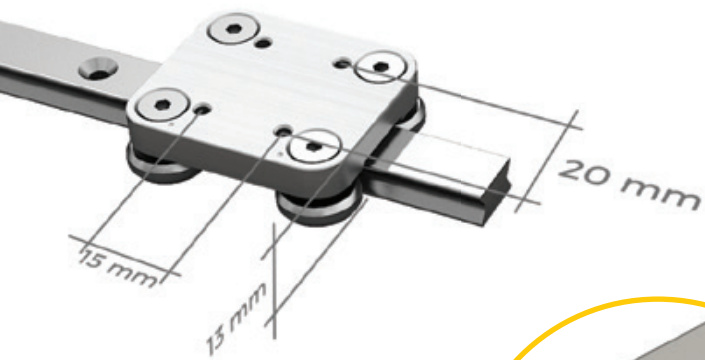
2

Long lifetime

Induction hardened raceways between 58 and 62 HRC.

3

Resistant to corrosion

Wide range of anticorrosion surface treatments

Easy installation

Eliminates the noise and difficult assembly associated with using mini ball guides.
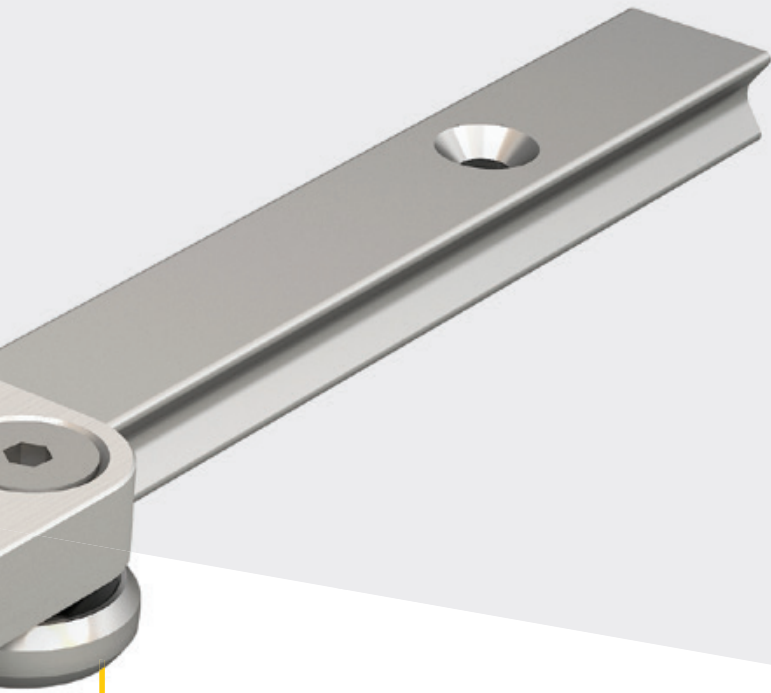
7

Easy mounting

Compensation of parallelism deviation up to 0.03 mm.

6

Optimal reliability in dirty environments

Ideal for harsh environments as their large rolling components make them highly resistant to dust and dirt contamination.

5

Uniquely quiet

Honed raceways and roller bearings for smooth and silent motion.

4

Easy preload adjustment

Adjustable rollers preload to customize rolling force and motion characteristics.

Content

MiniRoller Rail

Product explanation ⌄

❯ Compact linear guide with rollers, induction hardened and honed raceways

Fig. 1

MiniRoller Rail is a steel linear guide with compact design. It has radial roller bearings that glides on an induction hardened and honed raceway. It has been developed for applications that move moderate loads within tight spaces. MiniRoller Rail also manages parallelism deviation up to 0.03 mm.

The most important characteristics:

- Compact size
- Corrosion resistant surface
- Smooth motion
- Hardened and honed raceways surface
- Sliders with four rollers arranged in pairs
- Not sensitive to dirt due to the large rollers
- Low maintenance
- Quieter than recirculating ball systems
- MiniRoller Rail profile rails can be drop-in replace linear guides from another manufacturers while maintaining the same critical dimensions.

Preferred areas of application:

- Building and furniture
- Light handling machines, pick & place
- Special vehicles
- Diagnostic lab and liquid handling
- Pharmaceutical
- Food and beverage
- Interior design with special solutions
- Medical device manufacturing
- Vending & Kiosk machines

Rail:

Rails are made of cold-drawn carbon steel with electrolytic zinc-plated and passivated surface treatment as a standard corrosion protection. Other treatments are available for higher corrosion resistance, these include: zinc nickel and nickel plating. The raceways are induction hardened and honed for smoothness and maximizing the service life.

Fig. 2

Sliders:

The slider body is made of steel DIN 95MnPb28 with electrolytic zinc-plated and passivated surface treatment. Stainless-steel version is available upon request. Rollers are paired with concentric and eccentric types, which enables firm contact with raceway for smooth operation.

Fig. 3

Rollers:

Concentric and eccentric rollers comes with radial ball bearings made of steel or stainless steel as two different options. Roller bearing sealing options also comes with two different materials: 2RS rubber seals or 2Z steel shields. All roller bearings are lubricated for life.

Fig. 4

Technical data ⌄

Slider
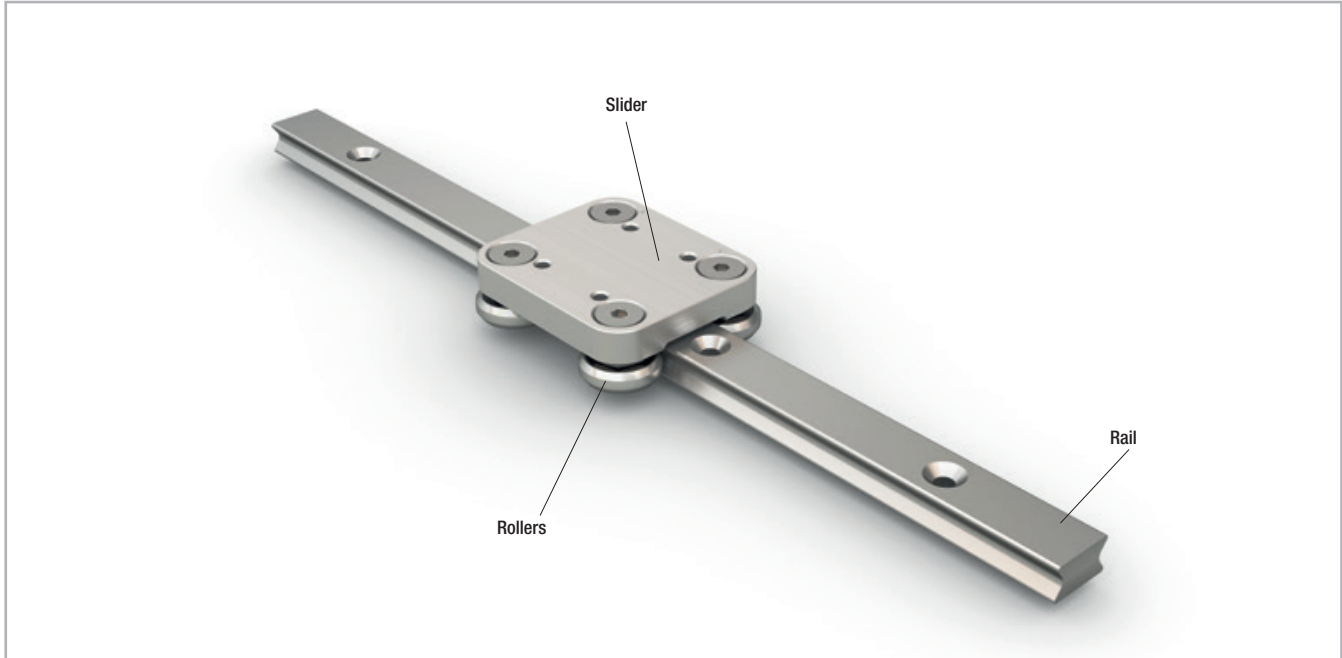
Rail

Rollers

Fig. 5

Performance characteristics:

- MiniRoller Rail available size: 11
- Max. slider operating speed on the rail: 3 m/s (118 in/s) (depending on application)
- Max. acceleration: 5 m/s² (196 in/s²) (depending on application)
- Available rail lengths up to 1950 mm (78.74 in)
- Temperature range: -20 °C to +120 °C (-4 °F to +248 °F) briefly up to max. +150 °C (+302 °F)
- Rail material: standard C43
- Rail raceways are induction hardened and honed
- Rails and slider bodies are standard electrolytic zinc-plated and passivated; increased anticorrosive protection on request (see pg. MRR-9 Anticorrosive protection)
- Slider body material: steel DIN 9SMnPb28, AISI 304 for the stainless-steel version
- Rollers material: standard steel 100Cr6, AISI 440C stainless steel version.
- Rollers are lubricated for life
- Roller seal/shield: standard 2Z (steel cover disk), 2RS (splash-proof)
- Maximum parallelism deviation: 0.03 mm

Remarks:

- With a simple adjustment of the eccentric roller (denoted with a marking on the bottom of the roller), the slider preload can be set to a desired preload or clearance.
- Factory preload setting also available
- Various surface treatments available upon request

MiniRoller Rail load capacities
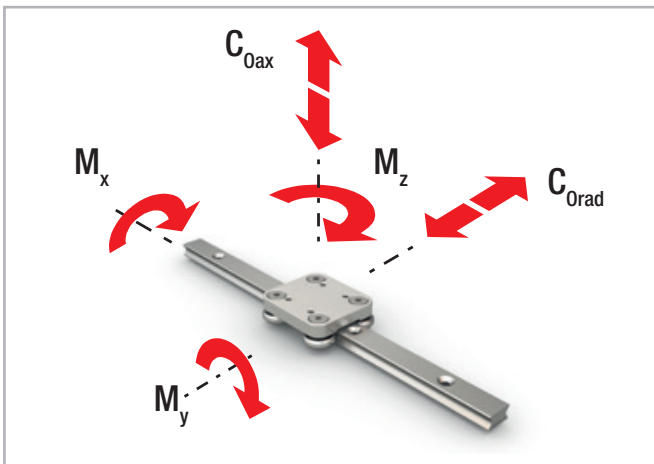
Fig. 6

Type	Load capacities [N]			Static moments [Nm]		
	C [N]	C_{0rad} [N]	C_{0ax} [N]	M_x [Nm]	M_y [Nm]	M_z [Nm]
SMR11	1530	820	375	2.3	5.9	10.3

Tab. 1

Product dimensions

Rail width
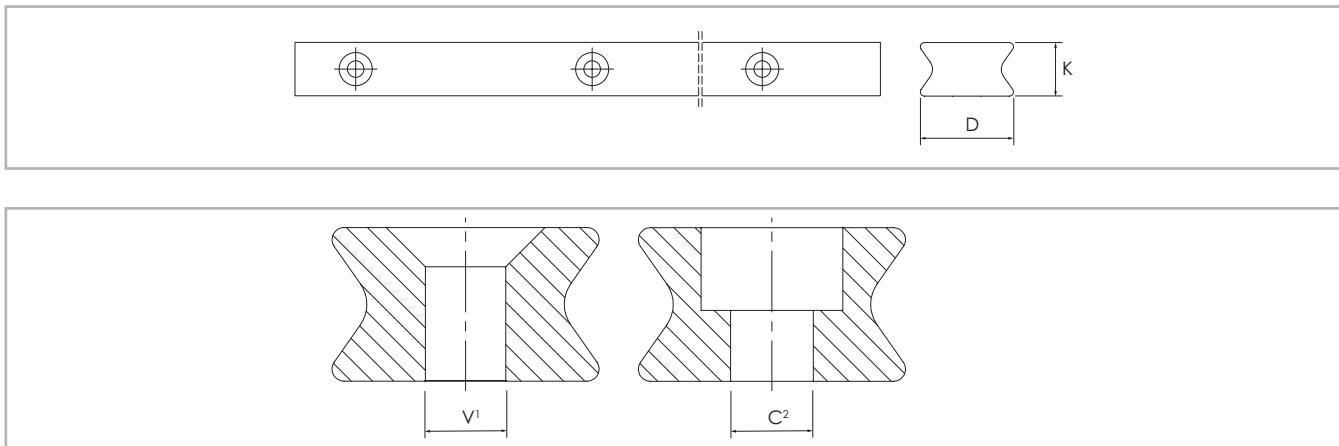
[1] Fixing holes (V) for countersunk 90 degrees head screws according to DIN 7991
[2] Fixing holes (C) for socket cap screws according to DIN 912

Fig. 6

Type	D [mm]	K [mm]	C[2]	V[1]	Weight [kg/m]
RMR...	11.3	6.5	M3	M3	0.48

Tab. 2

Rail length
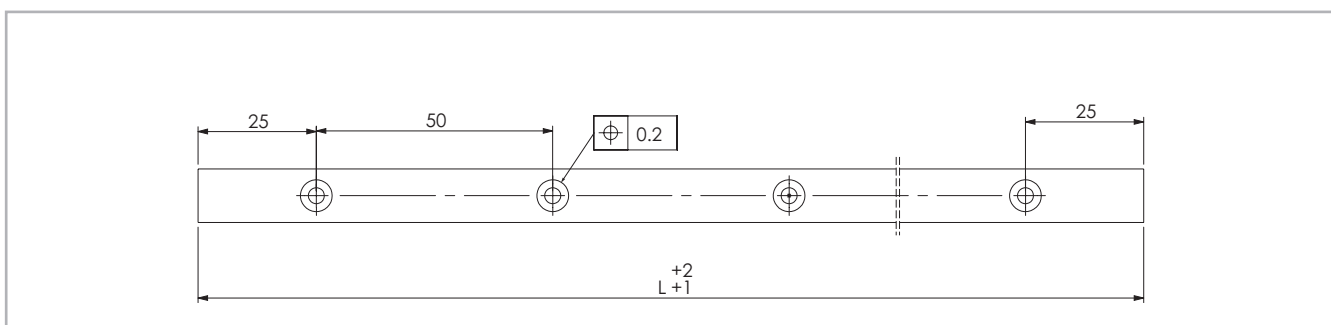
Fig. 7

Type	Size	Min length [mm]	Max length [mm]	Available standard lengths L [mm]
RMR...	11	150	1950	150 - 200 - 250 - 300 - 350 - 400 - 450 - 500 - 550 - 600 - 650 - 700 - 750 - 800 - 850 - 900 - 950 - 1000 - 1050 - 1100 -1150 - 1200 - 1250 - 1300 - 1350 - 1400 - 1450 - 1500 - 1550 - 1600 - 1650 - 1700 - 1750 - 1800 - 1850 - 1900 - 1950

Tab. 3

Slider
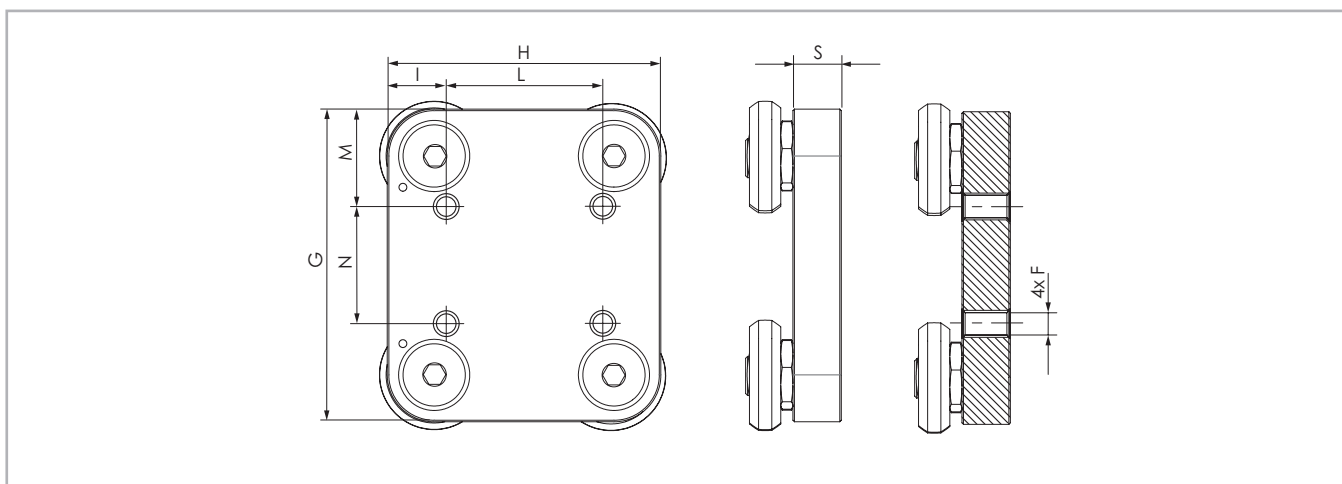
Fig. 8

Type	G [mm]	H [mm]	N [mm]	L [mm]	M [mm]	I [mm]	S [mm]	F	Weight [kg]
SMR11...	39	35	15	20	12	7.5	12.5	M3	0.08

Tab. 4

Mounted sliders and rails
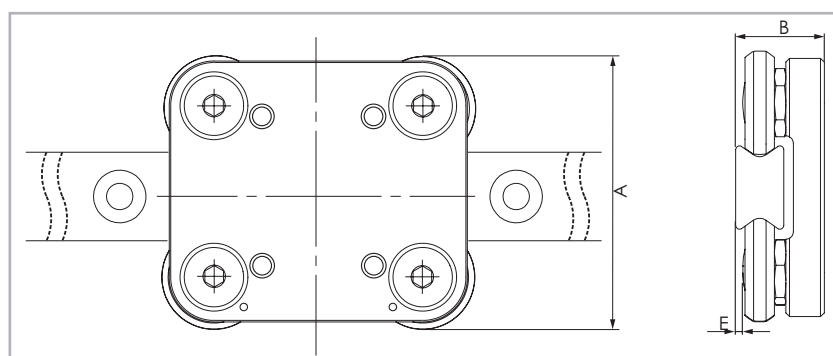
Fig. 9

Configuration	A [mm]	B [mm]	E [mm]
ZK-RMR...	38	13	0.75

Tab. 5

Accessories ⌄

› Rollers

CPN
Concentric roller

CPA
Eccentric roller
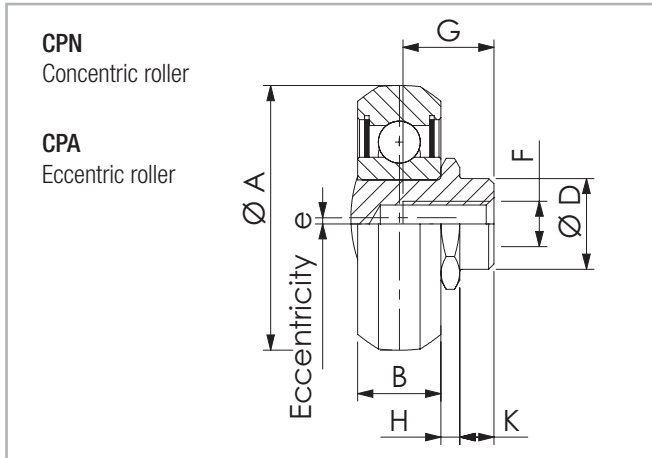
Seals: 2RS is the splash-proof seal, 2Z is the steel cover disc
Note: The rollers are lubricated for life

Fig. 11

Type		A [mm]	B [mm]	D [mm]	e [mm]	H [mm]	K [mm]	G [mm]	F	C [N]	C_{0rad} [N]	Weight [kg]
Steel	Inox											
CPN18-2RS	CXPNX18-2RS	14	4	6	-	1.55	1.8	5.5	M4	765	410	0.004
CPN18-2Z	-	14	4	6	-	1.55	1.8	5.5	M4	765	410	0.004
CPA18-2RS	CXPAX18-2RS	14	4	6	0.4	1.55	1.8	5.5	M4	765	410	0.004
CPA18-2Z	-	14	4	6	0.4	1.55	1.8	5.5	M4	765	410	0.004

Tab. 6

Technical Instructions ⌄

› Lubrication

Roller lubrication
All roller bearings of the MiniRoller rail are lubricated for life.

Lubrication of the raceways
Rails must be lubricated before operation. Recommended lubrication intervals are heavily dependent upon the ambient conditions, speed, and temperature. Under normal conditions, lubrication is recommended after 100 km operational performance or after an operating period of six months whichever comes first. In critical application cases the interval should be shorter. Please clean the raceways carefully before lubrication. We recommend a high quality roller bearing grease lubricant consisting of mineral oil with a white lithium soap base of NLGI 2 grade.

Proper lubrication during normal conditions:
- reduces friction
- reduces wear
- reduces running noise

Different lubricants are available by request for special applications:
- FDA-approved lubricant for use in the food industry
- specific lubricant for clean rooms
- specific lubricant for the marine technology sector
- specific lubricant for high and low temperatures
For specific information, contact Rollon technical support.

› Corrosion protection

The MiniRoller rails and slider bodies comes standard with electrolytic zinc plating with passivation for anticorrosion protection. If increased corrosion protection is required, application-specific surface treatments are available upon request for rails e.g. approved nickel plating for use in the food industry. In this case, the chosen treatment must be specified in the order rails using the appropriate code shown in the table below. For more information contact Rollon technical support.

Treatment	Characteristics
Electrolytic zinc plating with passivation	The treatment is commonly used in sectors where a major corrosion resistance is required. In case of rails with ground raceways the layer of the treatment is removed and the raceways are protected with post-grinding oil.
ZincNickel ISO19598 (Z)	Ideal for outdoor applications. Stainless steel sliders are ideal combined with zinc nickel rails.
Nickel Plating (N)	Provides high resistance to chemical corrosion and is ideal for applications in medical or food related environments. The raceways comes with Nickel plating treatment. Stainless steel sliders are ideal combined with nickel plated rails.

Tab. 7

▸ Preload

Preload classes

The factory installed systems, consisting of rails and sliders, are available in two preload classes:

Standard preload K1 means a rail-slider combination with minimum preload which means the rollers are adjusted free of clearance for optimal running properties.

Usually preload K2 is used for rail-slider systems for increasing the rigidity. When using a system with K2 preload a reduction of the loading capacities and service life must be taken into consideration (see tab. 8).

Preload class	Reduction y
K1	-
K2	0.1

Tab. 8

This coefficient y is used in the calculation formula for checking the static load and lifetime (see pg. MRR-14, fig. 16). The interference is the difference between the contact lines of the rollers and the raceways of the rail.

Rail size	Preload class	Interference* [mm]
11	K1	0.01
	K2	0.03

* Measured on the largest interior dimension between the raceways   Tab. 9

▸ Setting the preload

Fig. 12

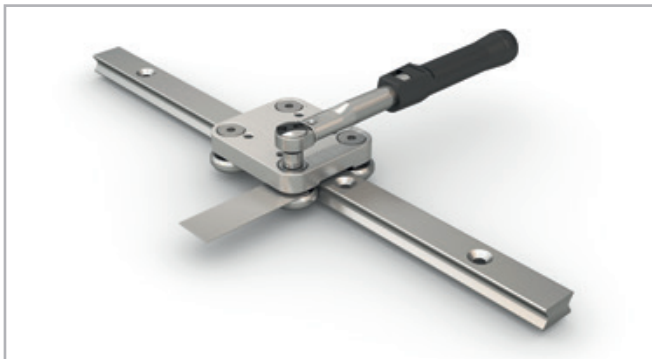| Type	Tightening torque [Nm]
ZK-RMR...	3

Tab. 10

If the MiniRoller rails are delivered as a system, the sliders are already set with no clearance. In this case the fixing screws are secured with thread locking glue at the factory.

If delivered separately, or if the sliders should be installed in another track, the eccentric roller pins must be readjusted. Important: The fixing screws must be additionally glued against loosening. The following points must also be observed:

- Use thread locking glue for fixing screws against coming loose.
- Wipe the raceways of any dirt and debris.
- Slightly loosen the fixing screws of the roller mounting. The eccentric roller pins are marked on the bottom.
- Position the slider(s) at the ends of the rail.
- The special flat key provided is inserted from the side onto the hexagon of the roller to be set (see fig. 12).

- By turning the flat key clockwise the roller is pressed against the raceway and thus reduces the clearance. Observe that with increasing preload, the friction is also increased and thus the service life reduced.
- Hold the roller pin with the adjustment key in the desired position and carefully tighten the fixing screw.
- Move the slider on the rail and check the preload over the entire length of the rail. It should move easily and the slider should not have play at any location of the rail.
- Now tighten the fixing screws with the specified tightening torque (see tab. 10), while the flat key holds the angle adjustment of the pin. A special thread in the roller pin secures the set position.

⟩ Speed and acceleration

The MiniRoller rail is suitable for low-to-moderate operating speeds and accelerations.

Size	Speed [m/s]	Acceleration [m/s²]
11	3	5

Tab. 11

⟩ Operating temperatures

The temperature range for continuous operation is: -20 °C / +120 °C with occasional peaks up to +150 °C.

Installation instructions ⌄

▸ Installation of two rails in parallel

If two MiniRoller rails are installed, the height difference of the two rails must not exceed a certain value (obtainable from the table below) in order to ensure proper guiding. These maximum values result from the maximum allowable twisting angle of the rollers in the raceways (see tab. 12).

Size	α
11	1 mrad (0.057°)

Tab. 12

Fig. 13

Example:
if a = 500 mm; b= a*tanα = 0.5 mm

When using two rails, the maximum parallelism deviation must not be exceeded (see tab. 13). Otherwise stresses can occur, which can result in a reduction in load capacity and service life.
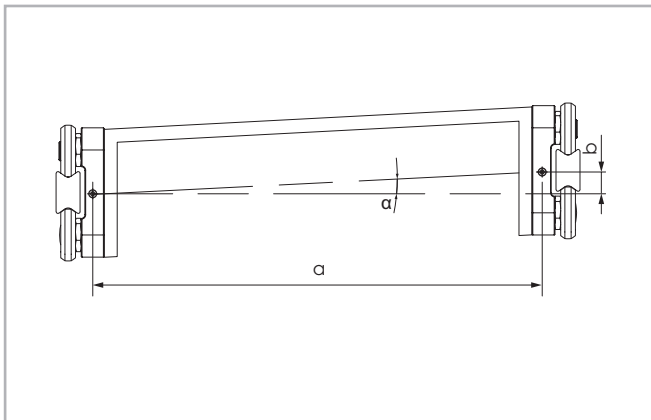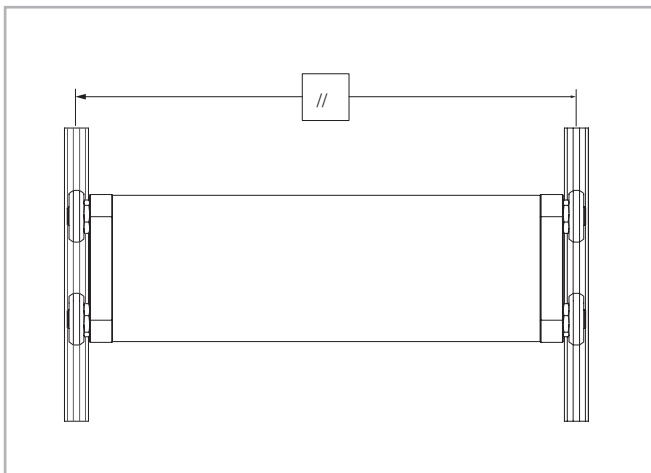
Size	K1	K2
11	0.03	0.02

Tab. 13

Fig. 14

Ordering key ⌄

› Rail / Slider system

ZK	-RMR	V C	11	-0000						
					N Z X					

Surface treatment *see p. MRR-9, tab.8*

Rail length in mm *see pg. MRR-11, tab 5*

Rail size

Rail holes type *see pg. MRR-6, tab.2*

Rail type

Ordering example:
ZK-RMRV11-1950-N

› Slider

SMR11	-4	- 2Z	
SMRX11		- 2RS	

Roller type (2Z, 2RS) *see pg. MRR-8, tab. 7*

Number of rollers

Slider Type (X=Stainless steel)

Ordering example:
SMR11-4-2Z

› Rail

RMR	V C	11	-0000		
				N Z	

Surface treatment (N=Nickel; Z=Zi-Ni;) *see pg. MRR-8, tab. 7*

Rail length in mm *see pg. MRR-11, tab. 5*

Rail size

Rail holes *see pg. MRR-6, tab.2*

Rail Type

Ordering example:
RMRV11-1950N

Calculation formulas ⌄

> Static load

The radial load capacity rating, C_{0rad} the axial load capacity rating C_{0ax}, and moments M_x, M_y, M_z indicate the maximum permissible values of the load (see pg. MRR-5), higher loads will have a detrimental effect on the running quality. A safety factor, S_0, is used to check the static load, which takes into account the basic parameters of the application and is defined more in detail in the following table:

Safety factor S_0	
No shock nor vibration, smooth and low-frequency reverse, high assembly accuracy, no elastic deformations	1.0 - 1.5
Normal installation conditions	1.5 - 2.0
Shock and vibration, high-frequency reverse, significant elastic deformation	2.0 - 3.5

Tab. 14

The ratio of the actual load to maximum permissible load may be as large as the reciprocal of the accepted safety factor, S_0, at the most.

$$\frac{P_{0rad}}{C_{0rad}} \leq \frac{1}{S_0} \qquad \frac{P_{0ax}}{C_{0ax}} \leq \frac{1}{S_0} \qquad \frac{M_1}{M_x} \leq \frac{1}{S_0} \qquad \frac{M_2}{M_y} \leq \frac{1}{S_0} \qquad \frac{M_3}{M_z} \leq \frac{1}{S_0}$$

Fig. 15

The above formulas are valid for a single load case.
If two or more forces are acting simultaneously, please check the following formula:

$$\frac{P_{0rad}}{C_{0rad}} + \frac{P_{0ax}}{C_{0ax}} + \frac{M_1}{M_x} + \frac{M_2}{M_y} + \frac{M_3}{M_z} + y \leq \frac{1}{S_0}$$

P_{0rad} = effective radial load (N)
C_{0rad} = permissible radial load (N)
P_{0ax} = effective axial load (N)
C_{0ax} = permissible axial load (N)
M_1, M_2, M_3 = external moments (Nm)
M_x, M_y, M_z = maximum permissible moments in the different loading directions (Nm)
y = reduction due to preload (see pg. MRR-10, Tab. 8)

Fig. 16

The safety factor S_0 can lie on the lower given limit if the occurring forces can be determined with sufficient precision. If shock and vibration are present, the higher value should be selected. For dynamic applications higher safety is required. Please contact Rollon technical support.

Slider load

Examples of formulas for determining the forces on the most heavily loaded slider

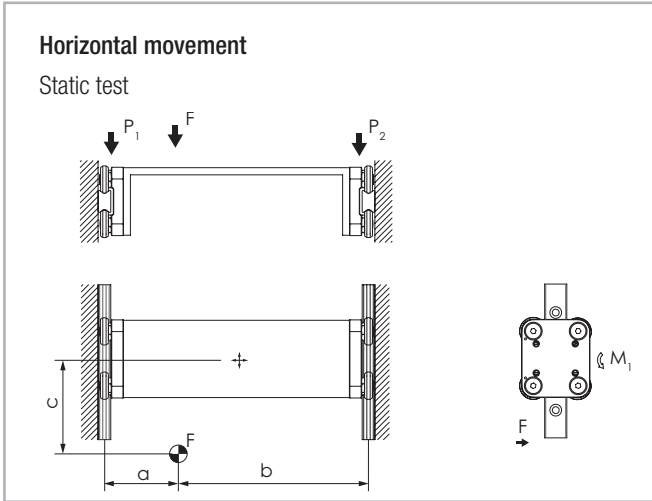For an explanation of the parameters in the formulas see pg. MRR-17, fig.28.

Horizontal movement
Static test

Fig. 17

Slider load:

$$P_1 = F \cdot \frac{b}{a+b}$$

$$P_2 = F - P_1$$

in addition each slider is
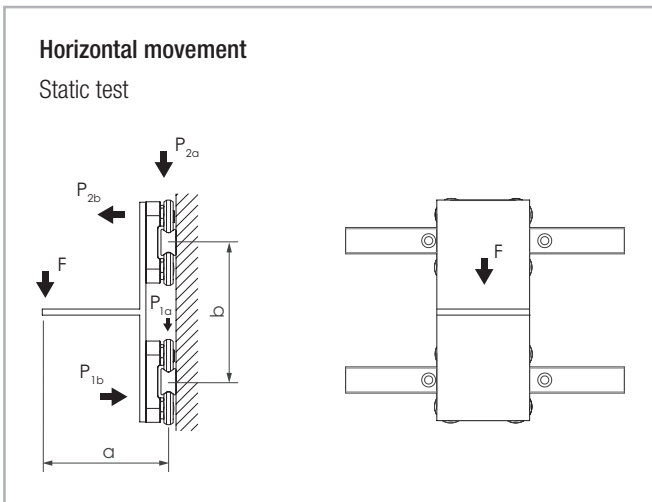loaded by a moment:

$$M_1 = \frac{F}{2} \cdot c$$

Fig. 20

Horizontal movement
Static test

Fig. 18

Slider load:

$$P_{1a} \cong P_{2a} = \frac{F}{2}$$

$$P_{2b} \cong P_{1b} = F \cdot \frac{a}{b}$$
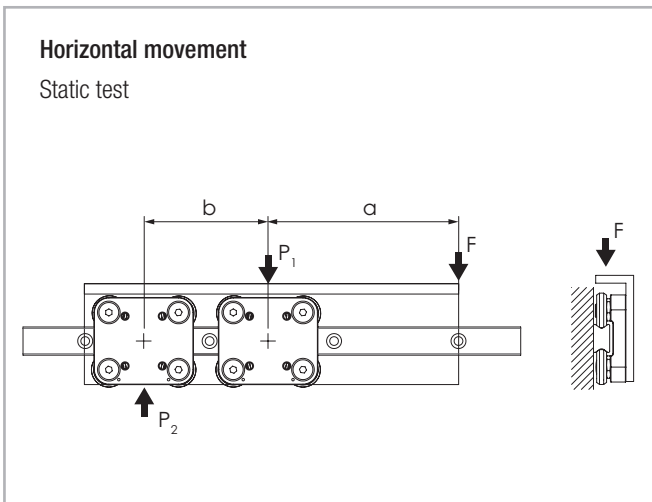
Fig. 21

Horizontal movement
Static test

Fig. 19

Slider load:

$$P_2 = F \cdot \frac{a}{b}$$

$$P_1 = P_2 + F$$

Fig. 22

Note: Applies only if the distance between centers of the sliders b > 2x
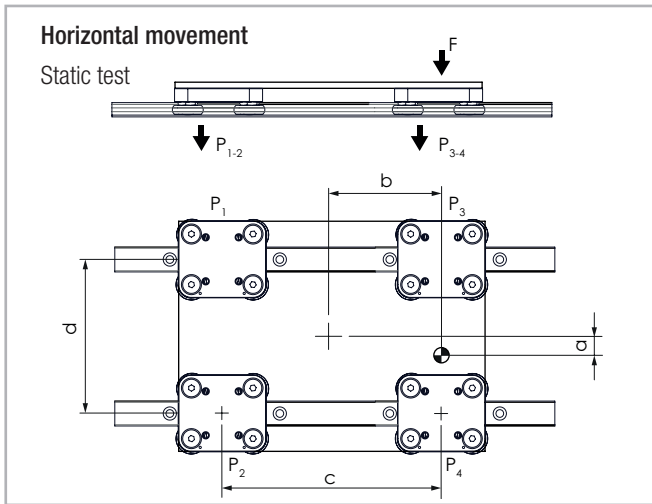slider length

Horizontal movement

Static test

Fig. 23

Slider load:

$$P_1 = \frac{F}{4} - \left(\frac{F}{2} \cdot \frac{b}{c} \right) - \left(\frac{F}{2} \cdot \frac{a}{d} \right)$$

$$P_2 = \frac{F}{4} - \left(\frac{F}{2} \cdot \frac{b}{c} \right) + \left(\frac{F}{2} \cdot \frac{a}{d} \right)$$

$$P_3 = \frac{F}{4} + \left(\frac{F}{2} \cdot \frac{b}{c} \right) - \left(\frac{F}{2} \cdot \frac{a}{d} \right)$$

$$P_4 = \frac{F}{4} + \left(\frac{F}{2} \cdot \frac{b}{c} \right) + \left(\frac{F}{2} \cdot \frac{a}{d} \right)$$

Fig. 25

Note: It is defined that slider no. 4 is always located closest to the point where the force is applied.
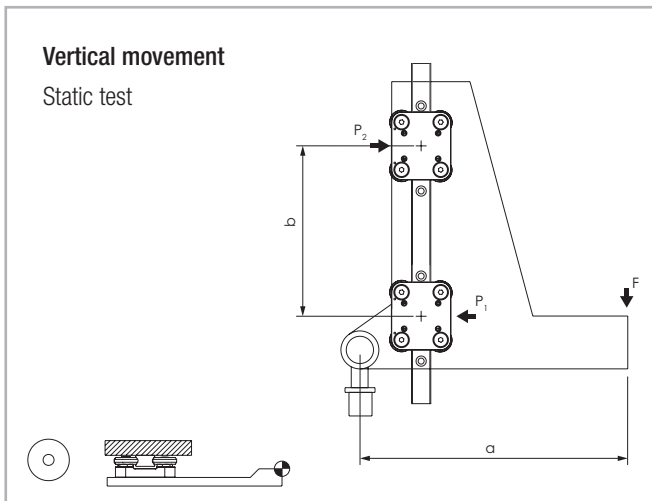
Vertical movement

Static test

Fig. 24

Slider load:

$$P_1 \cong P_2 = F \cdot \frac{a}{b}$$

Fig. 26

Note: Applies only if the distance between centers of the sliders b > 2x slider length
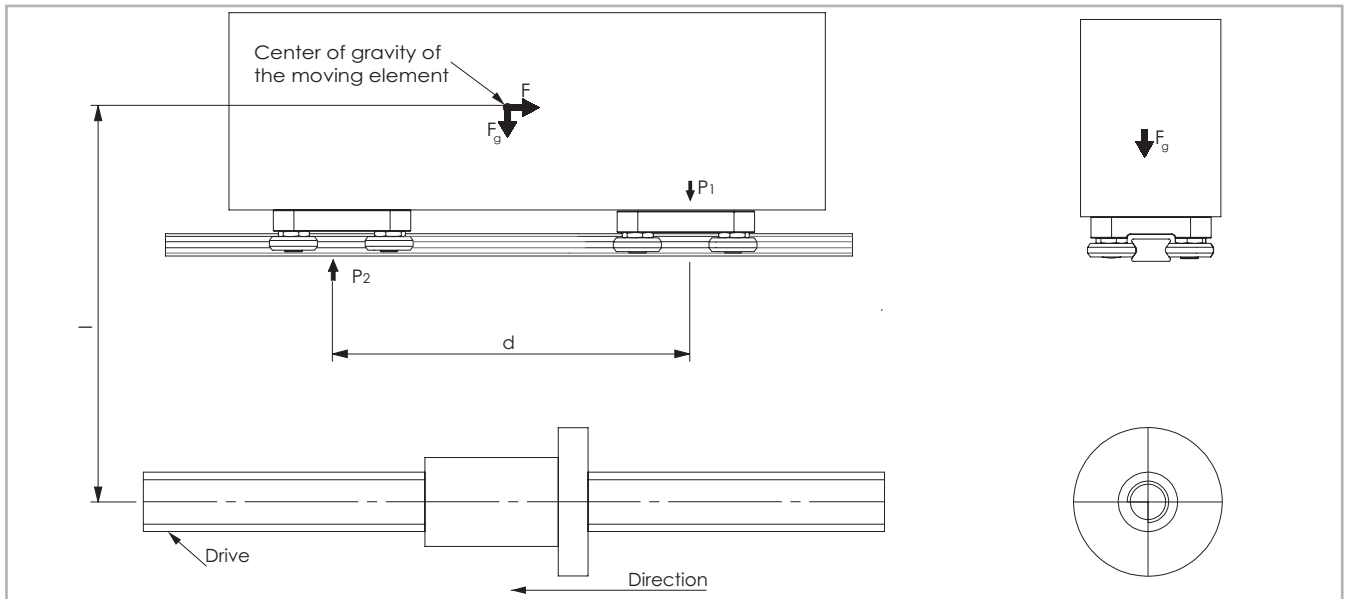
Fig. 27

Horizontal movement

Test with a moving element of the weight-force F_g at the instant the direction of movement changes

Inertial force

$$F = m \cdot a$$

Slider load at time of reverse

$$P_1 = \frac{F \cdot l}{d} + \frac{F_g}{2}$$

$$P_2 = \frac{F_g}{2} - \frac{F \cdot l}{d}$$

Fig. 28

Explanation of the calculation formula

F	=	effective force (N)
F_g	=	weight-force (N)
P_1, P_2, P_3, P_4	=	effective load on the slider (N)
M_1, M_2	=	effective moment (Nm)
m	=	mass (kg)
a	=	acceleration (m/s^2)

Fig. 29

Service life

The dynamic load capacity C is a conventional variable used for calculating the service life. This load corresponds to a nominal service life of 100 km. The following formula (see fig. 30) links the calculated theoretical service life to the dynamic load capacity and the equivalent load:

$$L_{Km} = 100 \cdot \left(\frac{C}{P} \cdot \frac{f_c}{f_i} \cdot f_h \right)^3$$

L_{km} = theoretical service life (km)
C = dynamic load capacity (N)
P = effective equivalent load (N)
f_c = contact factor
f_i = application coefficient
f_h = stroke factor

Fig. 30

The equivalent load P corresponds in its effects to the sum of the forces and moments working simultaneously on a slider. If these different load components are known, P results as follows:

$$P = P_r + \left(\frac{P_a}{C_{0ax}} + \frac{M_1}{M_x} + \frac{M_2}{M_y} + \frac{M_3}{M_z} + y \right) \cdot C_{0rad}$$

y = reduction due to preload
(see pg. MRR-10, Tab. 8)

Fig. 31

Here the external loads are assumed as constant in time. Brief loads, which do not exceed the maximum load capacities, do not have any relevant effect on the service life and can therefore be neglected.

The contact factor f_c refers to applications in which several sliders pass the same rail section. If two or more sliders move over the same point of a rail, the contact factor according to table 15 to be taken into account in the formula for calculation of the service life.

Number of sliders	1	2	3	4
f_c	1	0.8	0.7	0.63

Tab. 15

Calculation formulas

The application coefficient f_i takes into account the operational conditions in the service life calculation. It has a similar significance to the safety factor S_0 in the static load test. It is calculated as described in the following table:

f_i	
Neither shocks nor vibrations, smooth and low-frequency direction change; clean operating conditions; low speeds (<1 m/s)	1.0 - 1.5
Slight vibrations, average speeds (1 - 2.5 m/s) and average frequency of direction change	1.5 - 2.0
Shocks and vibrations, high speeds (> 2.5 m/s) and high-frequency direction change; extreme dirt contamination	2.0 - 3.5

Tab. 16

The stroke factor f_h takes into account the higher load of the raceways and rollers during short strokes on the same total length of run. The corresponding values are taken from the following graph (for strokes longer than 1 m, f_h =1):
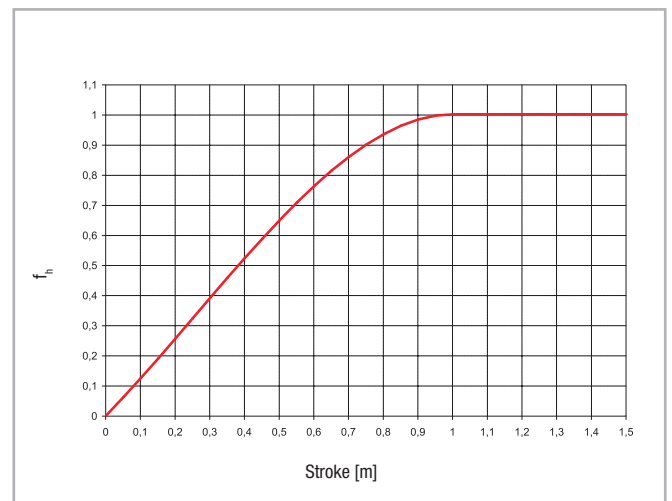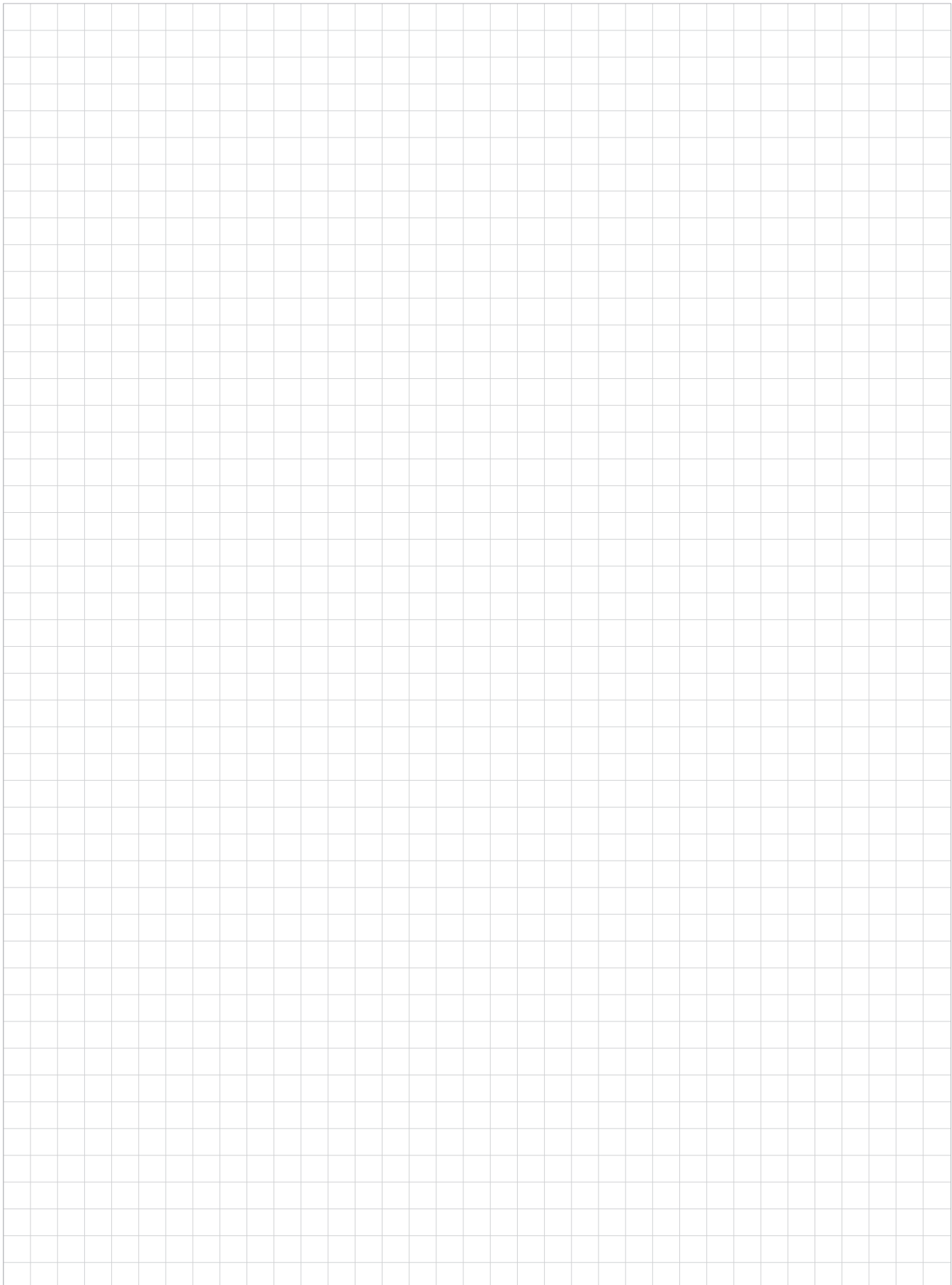

Fig. 32

Notes

Notes

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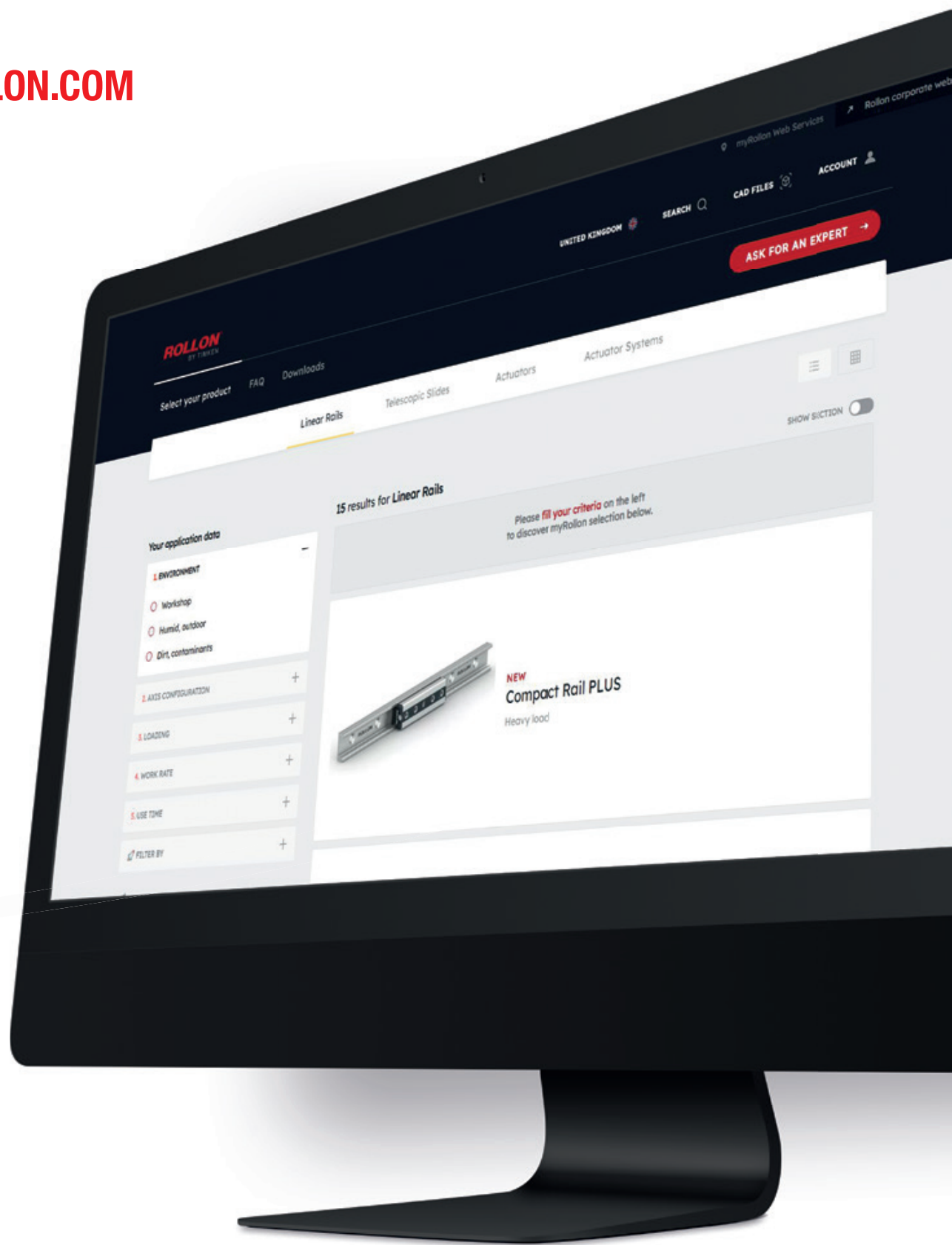
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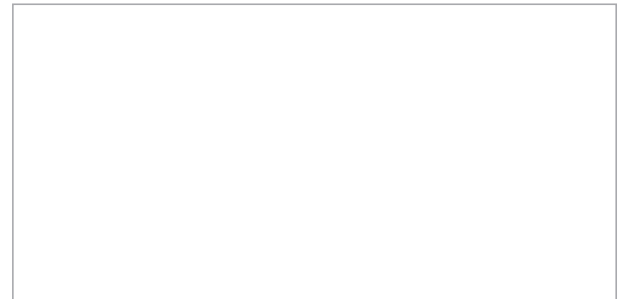www.rollonindia.in - info@rollonindia.in

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