

**THK**

**NEW**

**4mm(H)x8mm(W) Micro LM Guides**

**RSR3M/3N**



US, EPC,  
Patent Pending

**THK CO., LTD.**  
TOKYO, JAPAN

CATALOG No.293E

# THK Micro LM Guides RSR3M/3N

- The micro size allows space-saving design.
- Can be used in various fields of industry including micro machines and DNA analyzers.
- The rolling guide structure makes the system suitable for high-speed motion despite the micro size.

## Construction

In Micro LM Guides RSR3M/3N, balls roll in two rows of precision-ground raceways on an LN block and an LM rail, and the end plate attached to the LM block causes the trains of balls to circulate.

In a compact structure, the right and left rows of balls under a load contact the raceways at an angle of 45 degrees, allowing the system to be used in any orientation and achieving well-balanced rigidity.

The LM block, LM rail and balls are used martensitic stainless steel to achieve high corrosion resistance.

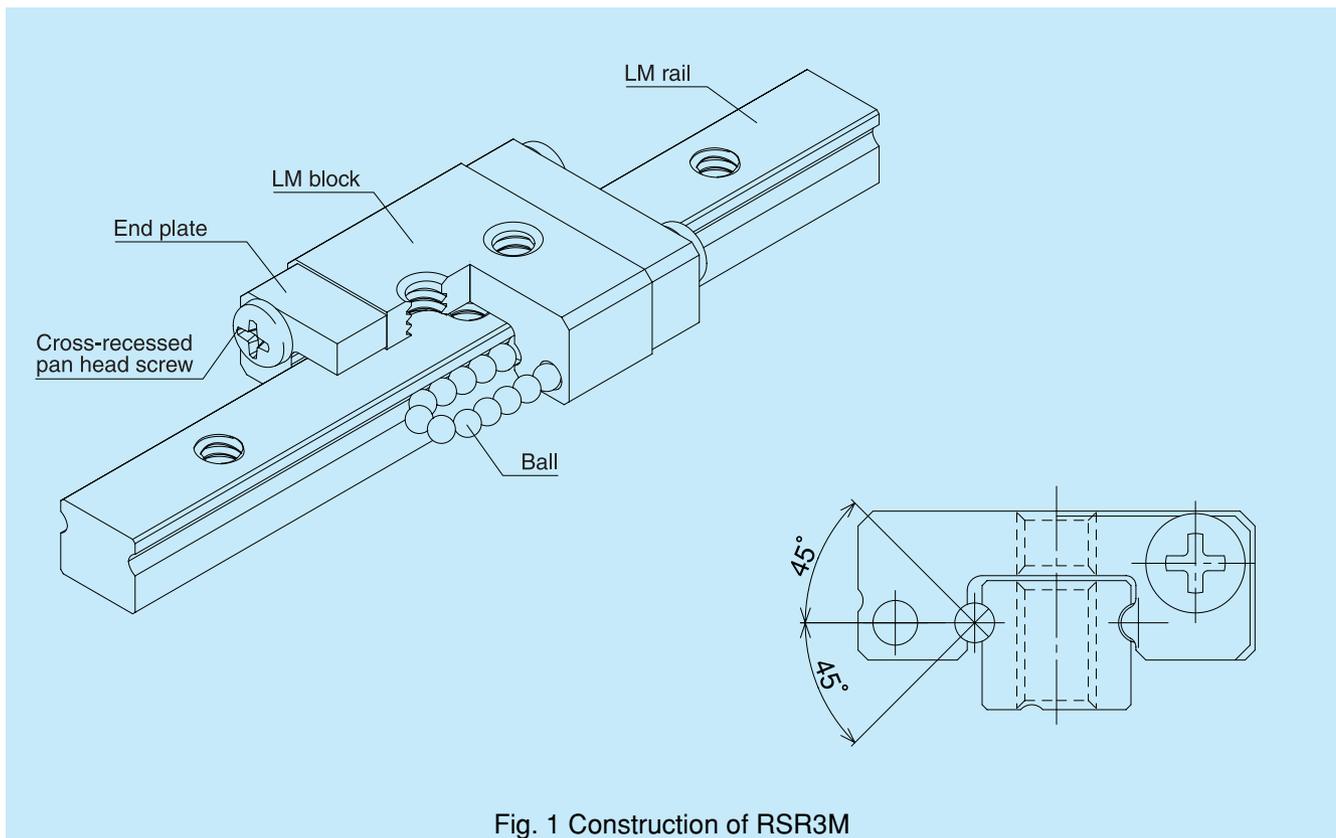


Fig. 1 Construction of RSR3M

## Features

- **Ultra compact design**  
RSR3M has the smallest cross-sectional dimensions among all LM Guide series systems. The ultra compact size allows space saving and weight saving for any device using the LM Guide and achieves high reliability.
- **Low rolling resistance**  
The unique structure of the ball circulation section allows stable motion at low rolling resistance.
- **Capable of bearing loads in all directions**  
The right and left rows of balls under a load contact the raceways at an angle of 45 degrees, enabling the system to bear loads in all directions.
- **Superb corrosion resistance**  
The LM block, LM rail and balls are used martensitic stainless steel to achieve high corrosion resistance, making the system optimal for use in medical equipment and clean rooms.

### Measurements of rolling resistance

The unique structure of the ball circulation section allows stable motion at low rolling resistance.

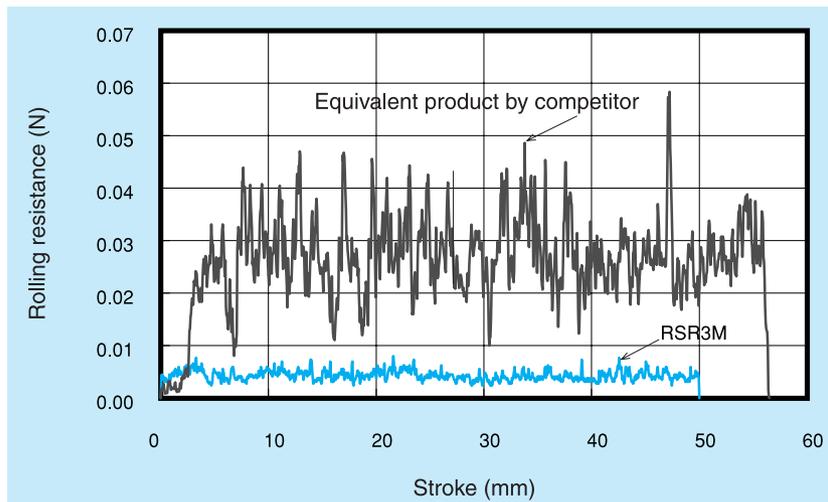


Fig. 2 Results of measuring rolling resistance

<Test conditions>

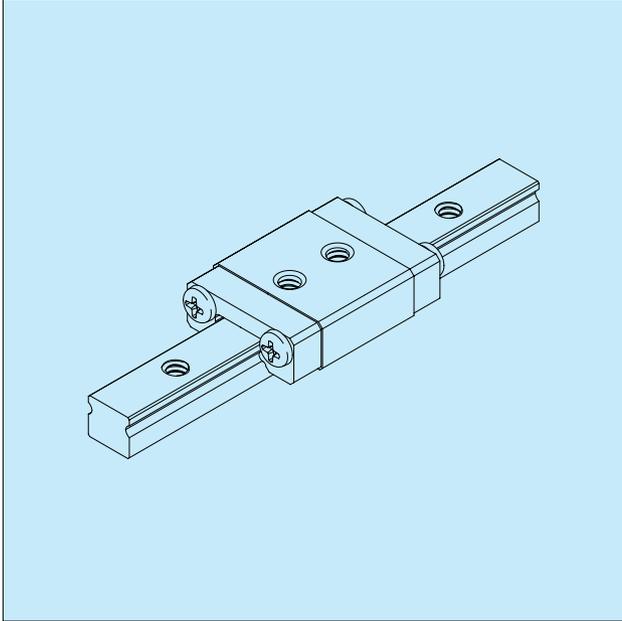
Feeding speed: 1mm/s

Applied load: no load (one LM block)

Mounting orientation: horizontally mounted on a surface table

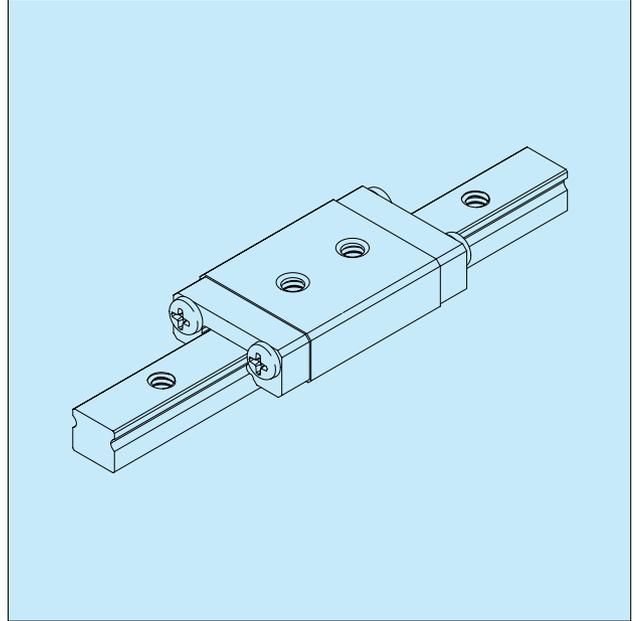
## Types

### Type RSR3M



Standard type of Micro LM Guide

### Type RSR3N

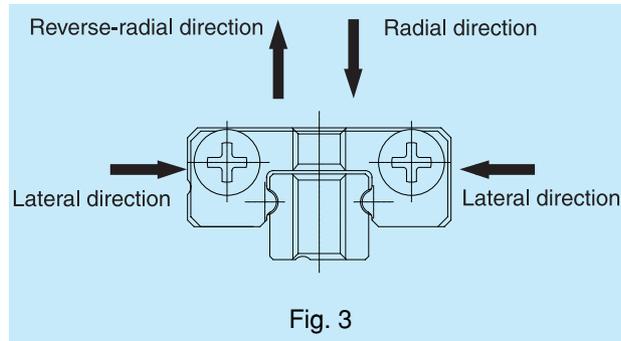


Large load-rating type with the longer-span LM block and more balls than RSR3M.

## Load rating

LM Guides RSR3M/3N can bear loads in all four directions: radial, reverse-radial, and the two lateral directions.

The basic load rating is uniform in all four directions (radial, reverse-radial, and the two lateral directions). The rating values are provided in the corresponding dimension table.



## Equivalent load

An equivalent load for types RSR3M/3N when radial and lateral loads, or reverse-radial and lateral loads, are simultaneously exerted on their LM blocks can be obtained using the following equation.

$$P_E = P_R (P_L) + P_T$$

$P_E$	: equivalent load	(N)
$P_R$	: radial load	(N)
$P_L$	: reverse-radial load	(N)
$P_T$	: lateral load	(N)

## Calculation of the service life

The nominal life of LM Guides RSR3M/3N can be obtained using the following equation.

$$L = \left( \frac{f_t \cdot f_c}{f_w} \cdot \frac{C}{P_c} \right)^3 \cdot 50$$

$L$	: nominal life	(km)
	(Nominal life L indicates the total distance that can be traveled without causing flaking by at least 90% of a group of LM Guides operated under the same conditions.)	
$C$	: basic dynamic-load rating	(N)
	(Basic dynamic-load rating C means the load under which the nominal life L is 50km and whose direction and magnitude does not fluctuate when a group of LM Guides operated under the same conditions.)	
$P_c$	: calculated load	(N)
$f_t$	: temperature factor (see general catalog)	
$f_c$	: contact factor (see general catalog)	
$f_w$	: load factor (see general catalog)	

Once nominal life L is obtained using this equation, the LM Guide service life can be calculated using the following equation, if the stroke length and the number of reciprocating cycles are constant:

$$L_h = \frac{L \times 10^6}{2 \times \ell_s \times n_1 \times 60}$$

$L_h$	: service life in hours	(h)
$\ell_s$	: stroke length	(mm)
$n_1$	: No. of reciprocating cycles per min	(min <sup>-1</sup> )

# Accuracy Standards

Accuracy standards for types RSR3M/3N are given in Table 1, and their LM rail lengths and running parallelisms are indicated in Fig. 5.

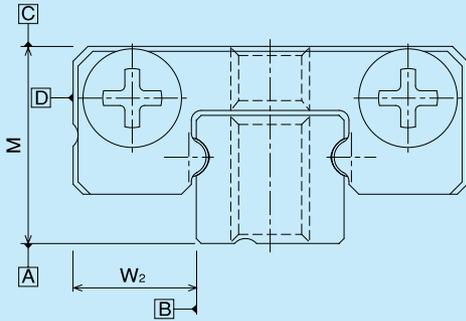


Fig. 4

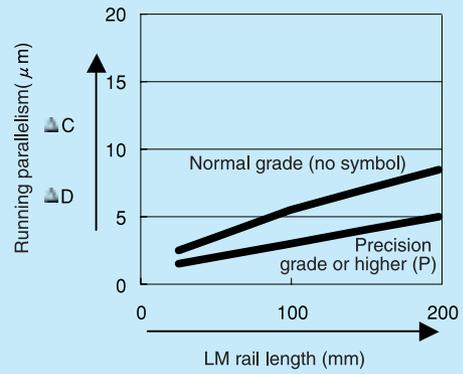


Fig. 5 LM rail length and running parallelism

Table 1 Accuracy standards for RSR3M/3N

Unit: mm

Model No.	Accuracy standard	Normal grade	Precision grade or higher
	Item	No symbol	P
RSR3M RSR3N	Tolerance of height M	± 0.03	± 0.015
	Difference in height M	0.015	0.005
	Tolerance of width W <sub>2</sub>	± 0.03	± 0.015
	Difference in width W <sub>2</sub>	0.015	0.005
	Running parallelism of surface C with respect to surface A	C (based on Fig. 5)	
	Running parallelism of surface D with respect to surface B	D (based on Fig. 5)	

## Radial Clearance Standards

Radial clearances of types RSR3M/3N are given in Table 2.

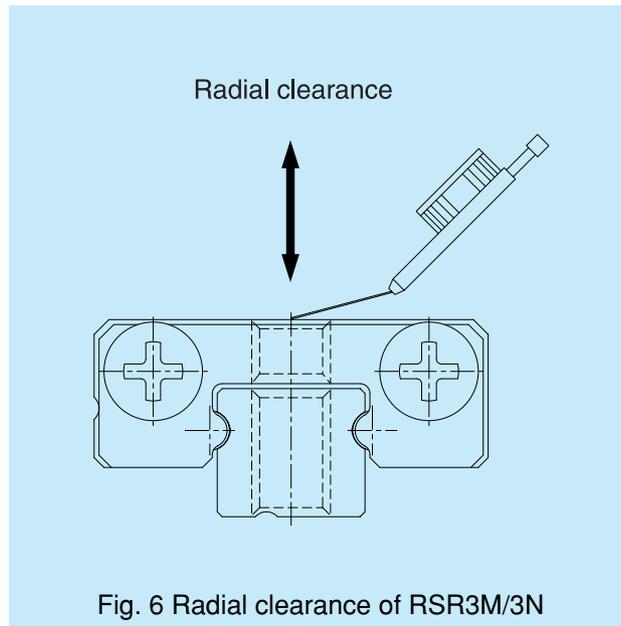


Table 2 Radial clearances of RSR3M/3N

Unit:  $\mu\text{m}$

Clearance symbol Model No.	Normal clearance No symbol	Under a light preload C1
RSR3M RSR3N	0 ~ +1	- 0.5 ~ 0

Note: For light-preload types, only the precision-grade or higher apply.

## Mounting-surface shoulder height and corner profile

Table 3 lists recommended shoulder heights for mounting the LM block and LM rail. To prevent corner beveling or interference between the LM block and LM rail, the corner of the mounting surface should have some clearance or should be machined to a radius equal to or less than  $r$  in Table 3.

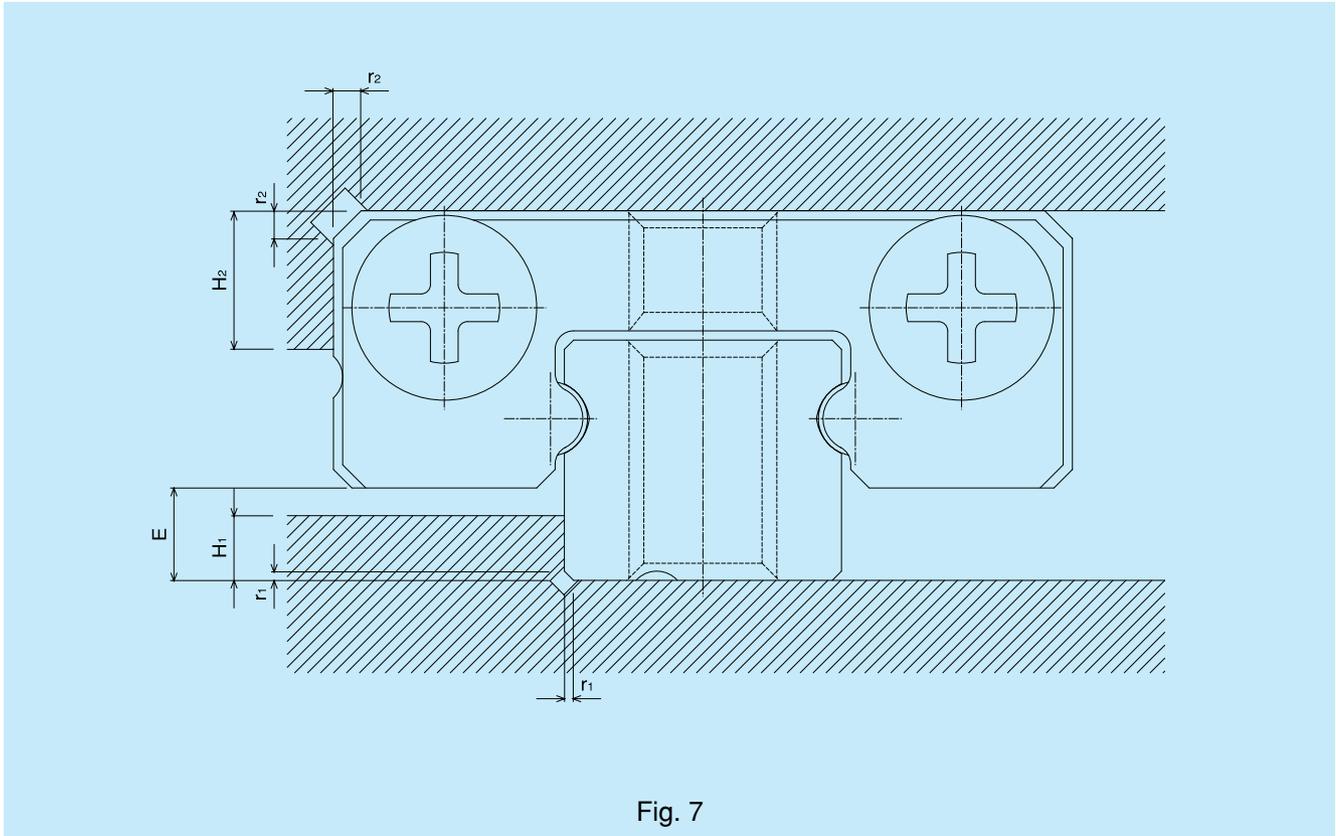


Fig. 7

Table 3 Mounting surface shoulder heights and corner profiles

Unit: mm

Model No.	LM rail corner radius $r_1$ (max.)	LM block corner radius $r_2$ (max.)	LM rail shoulder height $H_1$	LM block shoulder height $H_2$	E
RSR 3M RSR 3N	0.1	0.3	0.8	1.2	1

We recommend corner-stealing the rail.

## Mounting surface accuracy

Table 4 shows mounting surface accuracy for types RSR3M/3N with a normal clearance. In many case, flatness is combined with other precisions. Accordingly, we recommend applying 70% or less of the value in the table.

When using the system in the light-preload ( $C_1$  clearance) mode, we recommend applying 50% or less of the value in the table.

Table 4 Mounting surface accuracy of RSR3M/3N (with normal clearance)

Unit: mm

Flatness of the mounting surface	0.012/200
Tolerance of the axial parallelism	0.002
Tolerance of the axial level	0.015/200

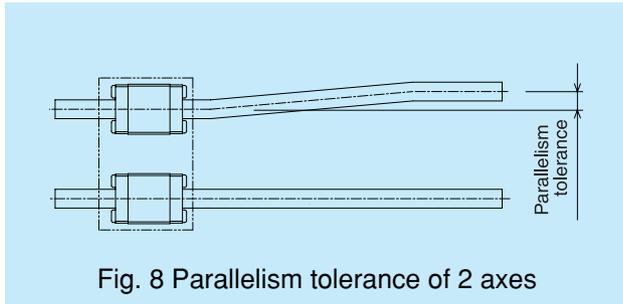


Fig. 8 Parallelism tolerance of 2 axes

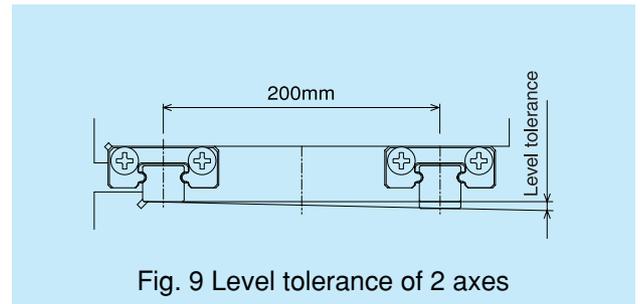


Fig. 9 Level tolerance of 2 axes

## Recommended tightening torque for mounting the system

Table 5 shows recommended tightening torque of bolts for mounting the LM blocks and the LM rails of RSR3M/3N.

Table 5 Recommended tightening torque for mounting bolts

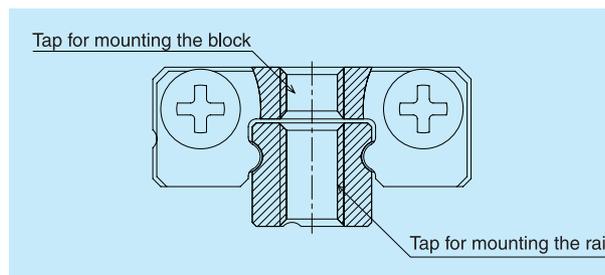
Bolt model No.	Recommended tightening torque [N·m]
M1.6	0.09
M2	0.19

Note: Applicable to austenitic stainless-steel hexagonal socket-head setscrews.

## Mounting the LM Guide

The taps for mounting the LM blocks and LM rails of RSR3M/3N are through. If the mounting bolts are screwed too deeply, they will interfere with the LM block and LM rail and negatively affect accuracy. Use much care when securing the mounting bolts.

In assembling RSR3M or 3N, an iron-made table was mounted to the LM block at the recommended tightening torque in Table 5 and then the radial clearance was adjusted, on the assumption that the LM block would be mounted on an iron table. Therefore, when mounting the LM Guide onto a table other than iron tables or mounting the guide with a torque other than a recommended tightening torque in Table 5, contact [THK](#).



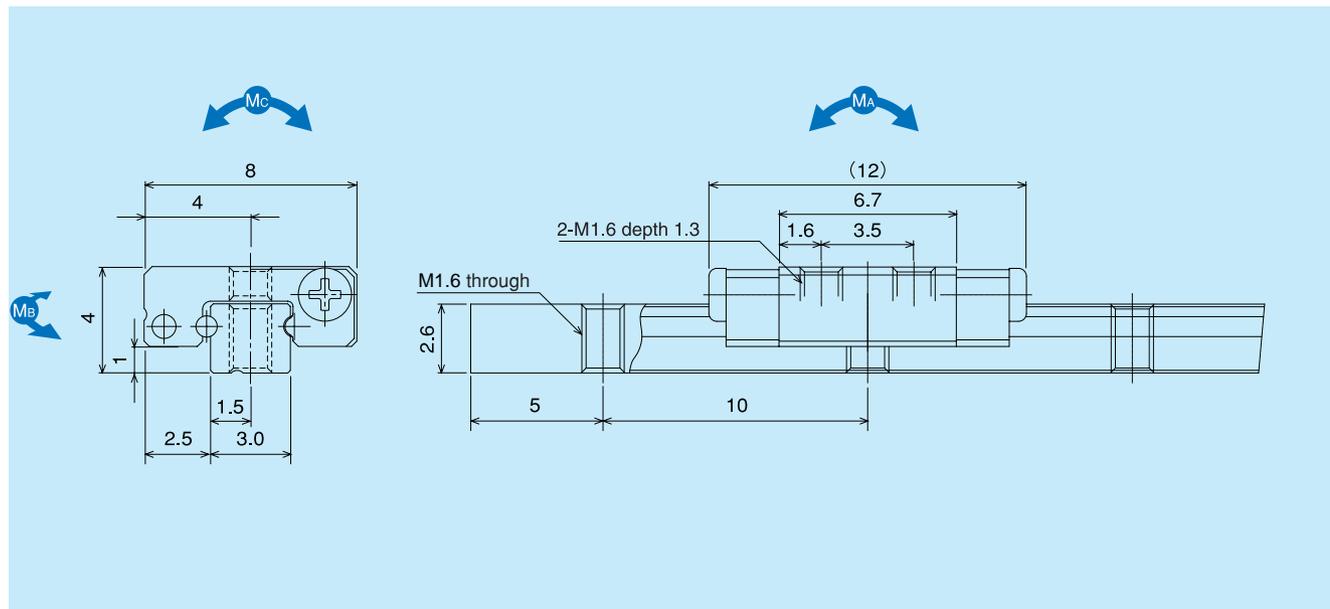
## Lubricant

Types RSR3M/3N are shipped with anti-corrosive oil applied (grease is not sealed). In using these LM Guides, regularly apply lubricant to the raceways on the rail according to the usage conditions.

Note 1: When you desire a grease-sealed type, contact [THK](#).

Note 2: RSR3M/3N do not have an oil hole for greasing. When using lubricant, apply it to the raceways of the LM rail.

# Standard Type RSR3M



Model No.	Basic load rating		Static permissible load			Mass	
	C (kN)	C <sub>0</sub> (kN)	M <sub>A</sub> (N-m)	M <sub>B</sub> (N-m)	M <sub>C</sub> (N-m)	LM block (gr)	LM rail (gr/m)
RSR 3M	0.18	0.27	0.33	0.33	0.50	1.1	55
LM rail standard length	30 mm	40 mm	60 mm	80 mm	100 mm		
LM rail maximum production length	200 mm						

Note: RSR3M does not have a sealed type.

Note: RSR3M does not have an oil hole for greasing. When using lubricant, directly apply it to the raceways of the LM rail.

Note: There is no joint-type LM rail. Only single-rail types within the production scope indicated above are supported.

## Model-number coding

2 RSR3M C1 + 100L P M - II

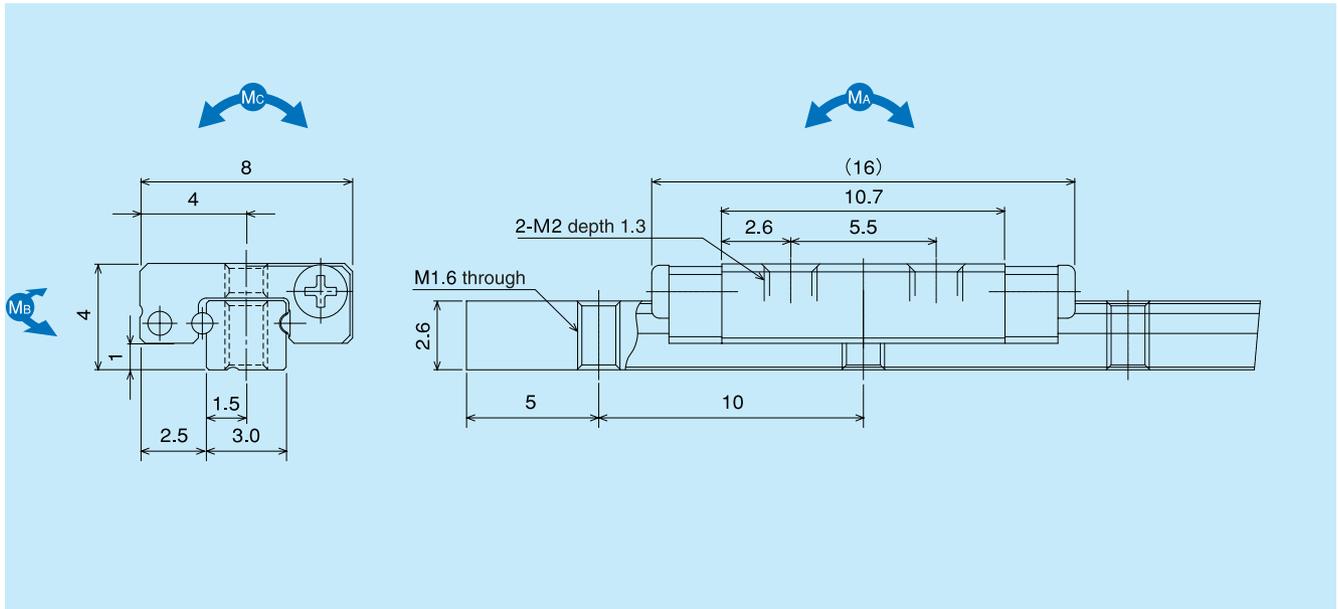
①                      ②                      ③                      ④                      ⑤                      ⑥                      ⑦

- ① No. of LM blocks combined on a single axis
- ② Model No.
- ③ Radial clearance symbol (see P.6)
- ④ LM-rail length (mm)
- ⑤ Accuracy grade (see P.5)
- ⑥ LM-rail material - stainless steel in this example (standard)
- ⑦ No. axes used on the same surface (\*)

\* Note: A configuration of two axes installed in parallel is given at least two sets of codes.

# Long Block Type

## RSR3N



Model No.	Basic load rating		Static permissible load			Mass	
	C (kN)	C <sub>0</sub> (kN)	M <sub>A</sub> (N-m)	M <sub>B</sub> (N-m)	M <sub>C</sub> (N-m)	LM block (gr)	LM rail (gr/m)
RSR 3N	0.30	0.44	0.81	0.81	0.82	1.6	55
LM rail standard length	30 mm	40 mm	60 mm	80 mm	100 mm		
LM rail maximum production length	200 mm						

Note: RSR3N does not have a sealed type.

Note: RSR3N does not have an oil hole for greasing. When using lubricant, directly apply it to the raceways of the LM rail.

Note: There is no joint-type LM rail. Only single-rail types within the production scope indicated above are supported.

### Model-number coding

**2 RSR3N C1 + 100L P M - 11**

No. of LM blocks combined on a single axis  
Model No.

Radial clearance symbol (see P.6)

LM-rail length (mm)

Accuracy grade (see P.5)

LM-rail material - stainless steel in this example (standard)

No. axes used on the same surface (\*)

\* Note: A configuration of two axes installed in parallel is given at least two sets of codes.

# THK 4mm (H) x 8mm (W) Micro LM Guides RSR3M/3N

## Notes on use

### \* Precautions when handling the LM block

Dropping or striking the LM block could damage it. Although rubber stoppers are attached to both ends of the LM rail in order to prevent balls from dropping when the LM block disengages from the LM rail, it is advisable to take much care in handling the LM block.

### \* Operating temperature

Do not use the LM block in temperatures above 80 °C as it uses a special resin.

### \* Service environment

When using the product in special environments such as those places where there are always vibrations, clean rooms, vacuum spaces and abnormally low/high temperatures, contact THK.

### \* Mounting surface accuracy

Since types RSR3M/3N use indentations with a pointed (gothic) arch shape, any discrepancy in the mounting surface accuracy can adversely affect the operation of the products. The LM Guides should be mounted on highly accurate mounting surfaces.

### \* Lubrication

Since the greasing interval varies depending on the usage conditions, contact THK.

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## THK CO., LTD.

HEAD OFFICE 3-11-6, NISHI-GOTANDA, SHINAGAWA-KU, TOKYO 141-8503 JAPAN  
INTERNATIONAL SALES DEPARTMENT PHONE:(03)5434-0351 FAX:(03)5434-0353

### U. S. A.

#### CHICAGO

PHONE:(847)310-1111 FAX:(847)310-1182

#### NEW JERSEY

PHONE:(201)529-1950 FAX:(201)529-1962

#### LOS ANGELES

PHONE:(714)891-6752 FAX:(714)894-9315

#### SAN FRANCISCO

PHONE:(925)455-8948 FAX:(925)455-8965

#### ATLANTA

PHONE:(770)840-7990 FAX:(770)840-7897

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PHONE:(317)243-3496 FAX:(317)243-3499

#### MINNEAPOLIS

PHONE:(612)953-4442 FAX:(612)953-4441

#### CANADA (TORONTO)

PHONE:(905)712-2922 FAX:(905)712-2925

#### BRASIL (SÃO PAULO)

PHONE:(011)3924-0911 FAX:(011)3924-0900

### GERMANY

#### DÜSSELDORF

PHONE:(02102)74250 FAX:(02102)7425299

#### STUTTGART

PHONE:(07150)91990 FAX:(07150)9199-888

#### U.K. (MILTON KEYNES)

PHONE:(01908)222159 FAX:(01908)222161

#### FRANCE (LYON)

PHONE:(0437)49.14.00 FAX:(0437)49.14.01

#### ITALY (MILAN)

PHONE:(039)2842079 FAX:(039)2842527

#### ITALY (BOLOGNA)

PHONE:(3951)6412211 FAX:(3951)6412230

#### SWEDEN (STOCKHOLM)

PHONE:(08)4457630 FAX:(08)4457639

#### AUSTRIA (LINZ)

PHONE:(07229)51400 FAX:(07229)51400-79

#### SPAIN (BARCELONA)

PHONE:(093)652-5740 FAX:(093)652-5746

### TAIWAN

#### TAIPEI

PHONE:(02)2585-8554 FAX:(02)2585-8495

#### TAICHUNG

PHONE:(04)2359-1505 FAX:(04)2359-1506

#### CHINA

##### BEIJING

PHONE:(10)6590-3557 FAX:(10)6590-3557

##### HONG KONG

PHONE:23761091, FAX:23760749  
23761252

##### SHANGHAI

PHONE:(21)6267-6571, FAX:(21)6267-6654  
(21)6267-6851

#### MALAYSIA (KUALA LUMPUR)

PHONE:(03)987-1137 FAX:(03)987-8071

#### INDIA (BANGALORE)

PHONE:(080)330-1524 FAX:(080)330-1524

#### KOREA (SEOUL)

PHONE:(02)3463-0351 FAX:(02)3017-0351

