

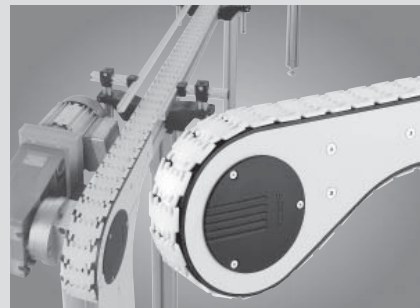
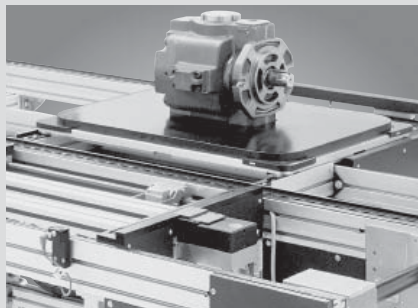
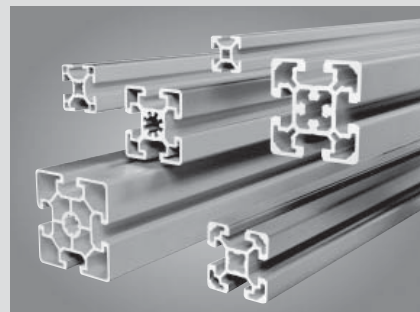
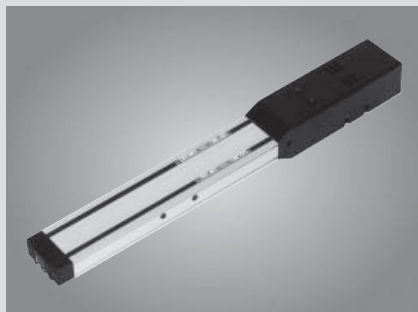
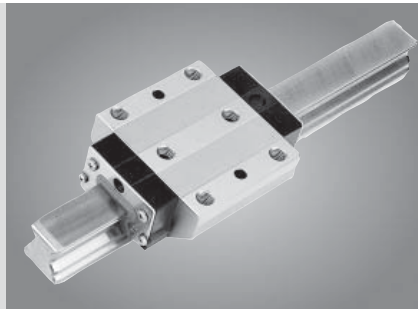
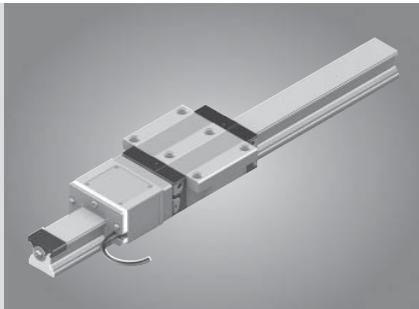
Integrated Measuring Systems for Ball and Roller Rail Systems

The Drive & Control Company



Linear Motion and Assembly Technologies

- Ball Rail Systems
- Roller Rail Systems
- Linear Bushings and Shafts
- Ball Screw Drives
- Linear Motion Systems
- Basic Mechanical Elements
- Manual Production Systems
- Transfer Technology



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Product Overview

Rexroth Ball Rail and Roller Rail Systems can be supplied with an integrated, inductive linear measuring system. This development combines the guiding and measuring functions in one unit and opens up new opportunities in machine design.

In a word: Mechatronics in practice.

Highlights: Integrated Measuring System

- The guide system and the measuring system form one unit, building on standard guide elements.
- No additional space is required, except possibly in the longitudinal direction to accommodate the sensor
- No external mounting surfaces required for measuring systems
- No measuring inaccuracies due to deviations in parallelism between the measuring system and the guideway
- Easy retrofitting and replacement

Inductive Measuring System

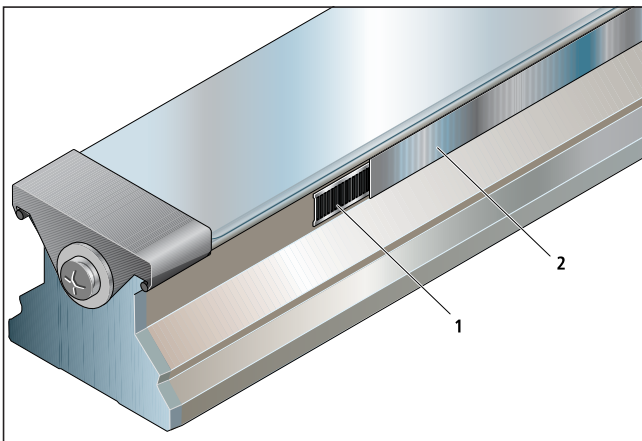
- Contact-free scanning ensures zero maintenance
- Resistant to water, oil, dust, shavings, etc.
- Insensitive to magnetic fields
- Virtually indestructible
- One-piece guide rails:
 - Standard length up to 4000 mm,
 - On request up to 4500 mm
- Several scanners can be mounted on one rail

Incremental Measuring Principle

- Precise position detection through a high-precision scale paired with distance coded reference marks
- High resolution, up to 0.25 μm

Guide rail with with integrated scale

- Same mounting pattern as standard guide rails
- Choice of single reference mark or distance coded reference marks over the entire rail length, covered by a laser-welded stainless steel strip



- 1) Steel scale integrated in the guide rail:
 - Insensitive to vibration
 - Thermal expansion matches that of the rail, guaranteeing consistently accurate measuring data
 - Non-magnetic, suitable for metal cutting machine environments
- 2) Scale protected by a laser-welded stainless steel strip

Integrated Measuring System for Ball Rail Systems

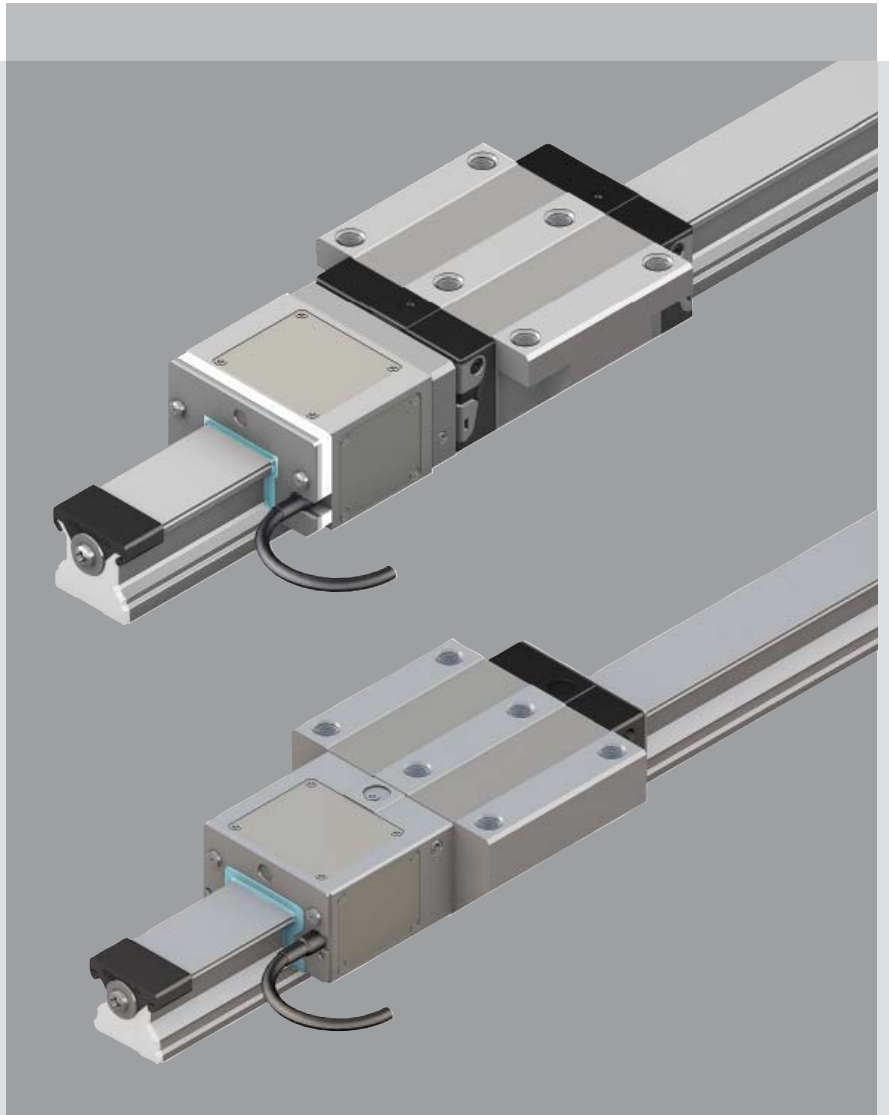
- Same mounting hole pattern as standard runner blocks
- Adapter plate allows scanner to be replaced during servicing (by Rexroth service engineers) without removing the runner block
(Installation requirements: Scanner fastening screws must be accessible and there must sufficient clearance at the end of the rail for pulling the scanner off.)

For more information on Ball Rail Systems, please refer to the "Ball Rail Systems" catalog.

Integrated Measuring System for Roller Rail Systems

- Same mounting hole pattern as standard runner blocks
- The sensor and runner block form one unit and must be replaced together when being serviced

For more information on Roller Rail Systems, please refer to the "Roller Rail Systems" catalog.



Product Overview, Standard Range

Ball Rail Systems		Size				
Runner blocks		20	25	30	35	45
Flanged, normal, standard height FNS R1651	Signal type	1 V _{pp} / TTL	1 V _{pp} / TTL	1 V _{pp} / TTL	1 V _{pp} / TTL	1 V _{pp} / TTL
	Accuracy class	P	P	P	P	P
	Preload	0.08 C	0.08 C	0.08 C	0.08 C	0.08 C
Flanged, long, standard height FLS R1653	Signal type	1 V _{pp} / TTL	1 V _{pp} / TTL	1 V _{pp} / TTL	1 V _{pp} / TTL	1 V _{pp} / TTL
	Accuracy class	P	P	P	P	P
	Preload	0.08 C	0.08 C	0.08 C	0.08 C	0.08 C
Slimline, normal, standard height SNS R1622	Signal type	1 V _{pp} / TTL	1 V _{pp} / TTL	1 V _{pp} / TTL	1 V _{pp} / TTL	1 V _{pp} / TTL
	Accuracy class	P	P	P	P	P
	Preload	0.08 C	0.08 C	0.08 C	0.08 C	0.08 C
Slimline, long, standard height SLS R1623	Signal type	1 V _{pp} / TTL	1 V _{pp} / TTL	1 V _{pp} / TTL	1 V _{pp} / TTL	1 V _{pp} / TTL
	Accuracy class	P	P	P	P	P
	Preload	0.08 C	0.08 C	0.08 C	0.08 C	0.08 C
Slimline, normal, high SNH R1621	Signal type	–	1 V _{pp} / TTL	1 V _{pp} / TTL	1 V _{pp} / TTL	1 V _{pp} / TTL
	Accuracy class	–	P	P	P	P
	Preload	–	0.08 C	0.08 C	0.08 C	0.08 C
Slimline, long, high SLH R1624	Signal type	–	1 V _{pp} / TTL	1 V _{pp} / TTL	1 V _{pp} / TTL	1 V _{pp} / TTL
	Accuracy class	–	P	P	P	P
	Preload	–	0.08 C	0.08 C	0.08 C	0.08 C

Other accuracy and preload classes on request

Roller Rail Systems		Size			
Runner blocks		35	45	55	65
Standard width FNS R1851	Signal type	1 V _{pp} / TTL	1 V _{pp} / TTL	1 V _{pp} / TTL	1 V _{pp} / TTL
	Accuracy class	SP	SP	SP	SP
	Preload	0.08 / 0.13 C	0.08 / 0.13 C	0.08 / 0.13 C	0.08 / 0.13 C
Standard width, long FLS R1853	Signal type	1 V _{pp} / TTL	1 V _{pp} / TTL	1 V _{pp} / TTL	1 V _{pp} / TTL
	Accuracy class	SP	SP	SP	SP
	Preload	0.08 / 0.13 C	0.08 / 0.13 C	0.08 / 0.13 C	0.08 / 0.13 C
Slimline, normal, high SNH R1821	Signal type	1 V _{pp} / TTL	1 V _{pp} / TTL	1 V _{pp} / TTL	1 V _{pp} / TTL
	Accuracy class	SP	SP	SP	SP
	Preload	0.08 / 0.13 C	0.08 / 0.13 C	0.08 / 0.13 C	0.08 / 0.13 C
Slimline, long, high SLH R1824	Signal type	1 V _{pp} / TTL	1 V _{pp} / TTL	1 V _{pp} / TTL	1 V _{pp} / TTL
	Accuracy class	SP	SP	SP	SP
	Preload	0.08 / 0.13 C	0.08 / 0.13 C	0.08 / 0.13 C	0.08 / 0.13 C

Accuracy class P on request

Product Overview and Technical Data

Scale

The scale (1), a high precision graduated steel strip, is welded into a groove on the guide rail and protected by a rust-proof laser-welded stainless-steel band (2).

The scale used by Rexroth is produced on a specially designed machine and has the following features:

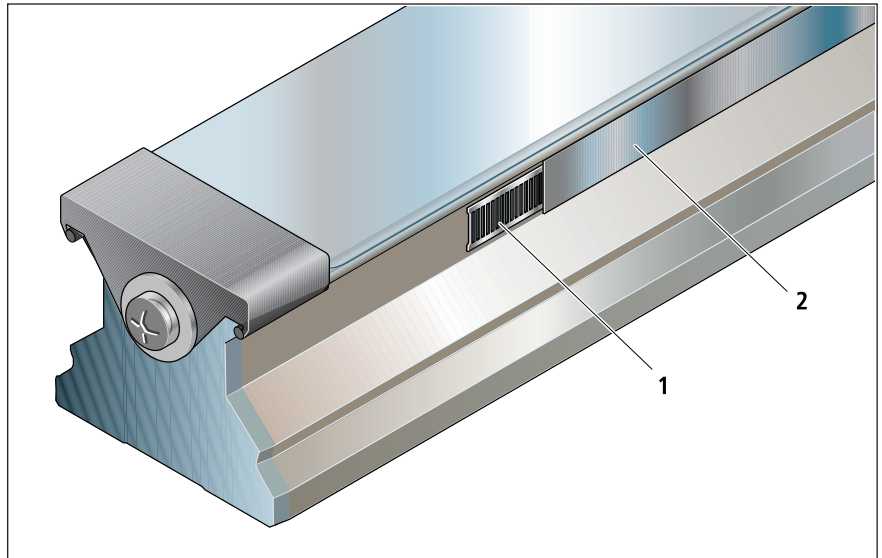
- pitch of 1000 μm ,
- same thermal expansion coefficient as the guide rail

$$\alpha_{\text{therm}} \approx 11 \cdot 10^{-6} \text{ K}^{-1}$$

- Max. measuring length:

$$M_L = L - (2 \times 30 \text{ mm})$$

For manufacturing reasons, the measuring length is shorter than the rail length by 30 mm at each end of the rail.



Reference Marks

When scanned, the scale itself delivers only ascending or descending numerical values (incremental signals): incremental measuring principle.

Distance Coded Reference Marks

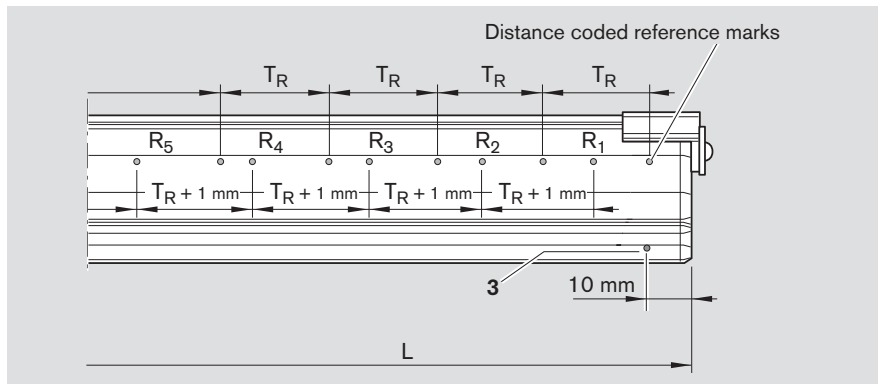
In order to be able to approach a specific position, an absolute reference point is necessary.

This reference point is achieved by **distance coded reference marks** that are machined into the guide rail on the side opposite the scale, to deliver a reference signal. The reference marks are also protected by a tightly welded stainless-steel strip. The side with reference marks is designated by a hole drilled into the reference edge of the guide rail (3).

The advantage of distance coded reference marks is that an absolute positioning signal is available as soon as the sensor on the runner block has passed two reference marks.

Single, absolute reference mark

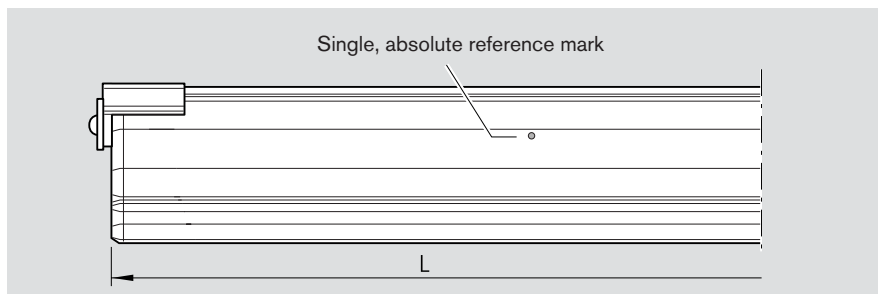
The location of the reference mark may be defined by the customer, but must remain within the measuring range. If the reference mark coincides with a rail mounting hole, it must be shifted up to 8 mm.



R_1 to R_n = reference marks

Distance coding of reference marks

L_{max} (mm)	T_R (mm)
800	40
2400	70
4000	90



Product Overview and Technical Data

Scanning Signals Output Signals

The relative, non-contacting motion between the two elements generates:

- **sinusoidal voltage signals (1 V_{pp})**, supplied directly by the sensor during scanning,
- or **square-wave output signals (RS 422 A)**, available after the interpolation unit.

Both signal outputs are equipped with evaluation electronics in real-time mode so that highly dynamic drives can be served.

Signal Types Analog

Sinusoidal scanning signals 1 V_{pp}

Incremental signals

Sinusoidal signals $U_{\sin+}$ and $U_{\cos+}$ and their inverse signals $U_{\sin-}$ and $U_{\cos-}$.

Signal magnitude:

$U_{\sin}/U_{\cos} = 1 V_{pp}$ (0.6 to 1.2 V) with terminating resistance $Z_0 = 120 \Omega$

Reference mark signals

One or multiple signal peaks U_{RI+} and their inverse signals U_{RI-} .

Signal magnitude:

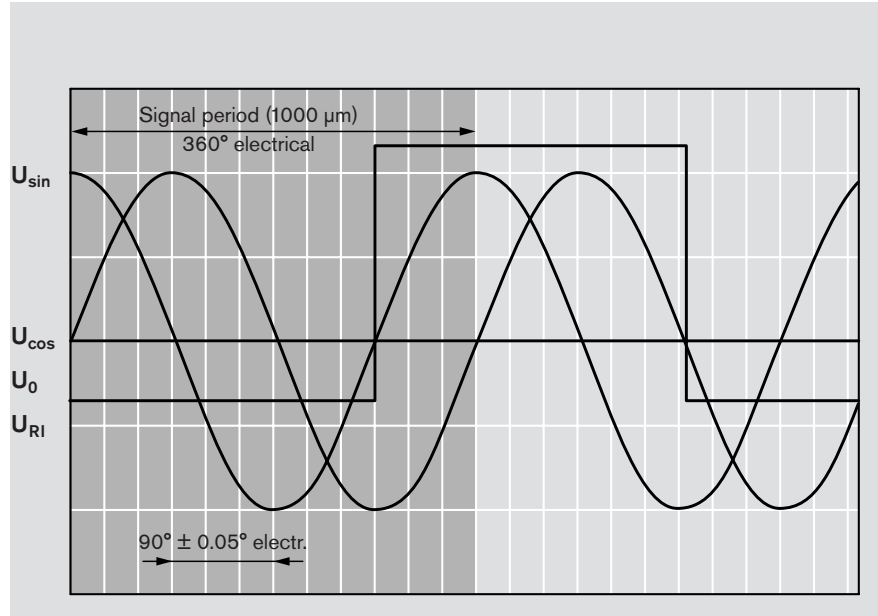
$U_{RI} \geq 0.5 V$ (usable component) with terminating resistance $Z_0 = 120 \Omega$

$U_0 = 2.5 V \pm 0.5 V$

$U_{\sin} \hat{=} A+$ track

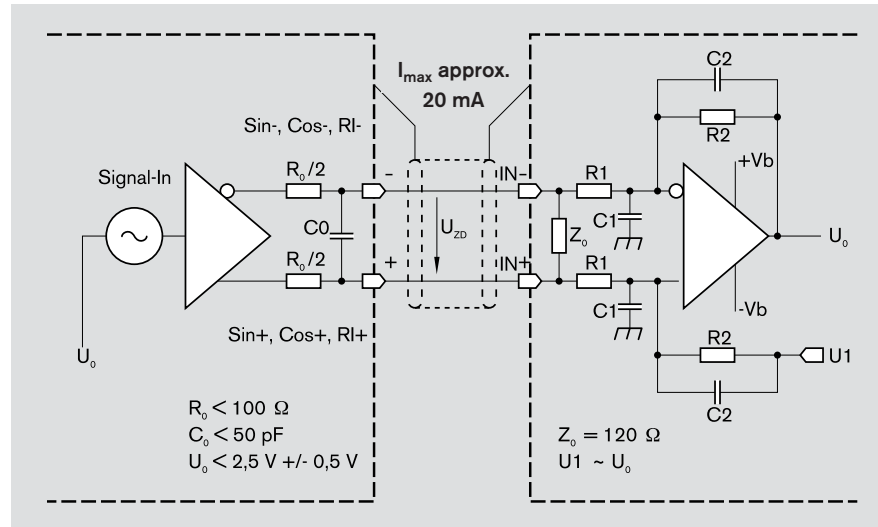
$U_{\cos} \hat{=} B+$ track

$U_{RI} \hat{=} R+$ track



Graphical representation of sensor signals in positive counting direction

Recommended interface circuitry for sinusoidal signals



Digital

Square-wave TTL output signals through an integrated interpolation unit

Incremental signals

TTL-square-wave signals A+, B+ and their inverse signals A-, B- according to the RS 422 standard (DIN 66259 part 3).

Reference mark signals

One or multiple square-wave pulses RI+ and their inverse pulses RI-.
 Pulse width: 90° electr.
 Delay time: $|t_d| < 0.1 \mu s$

TTL signal level

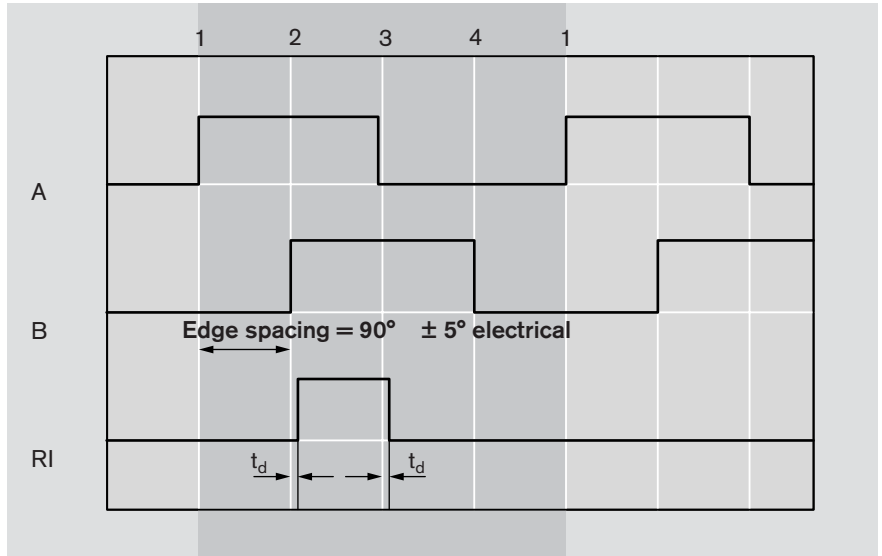
$U_H > 2.5 V$ at $-I_H = 20 mA$
 $U_L < 0.5 V$ at $I_L = 20 mA$

Capacity

- $-I_H \leq 20 mA$
- $I_L \leq 20 mA$
- $C_{load} \leq 1000 pF$

Switching times:

- Rise time: $t_+ \leq 100 ns$
- Decay time: $t_- \leq 100 ns$
- Terminal resistance $Z_0 = 120 \Omega$



Graphical representation of sensor signals in positive counting direction

Resolution and interpolation

Rexroth offers different resolution rates: 0.25 μm , 1 μm , 5 μm , 10 μm

The sinusoidal scanning signal must be interpolated to achieve these resolutions. No external unit is needed for interpolation. For resolution rates of 0.25 μm , 1 μm , 5 μm and 10 μm , the interpolation unit is integrated in the scanner (sensor).

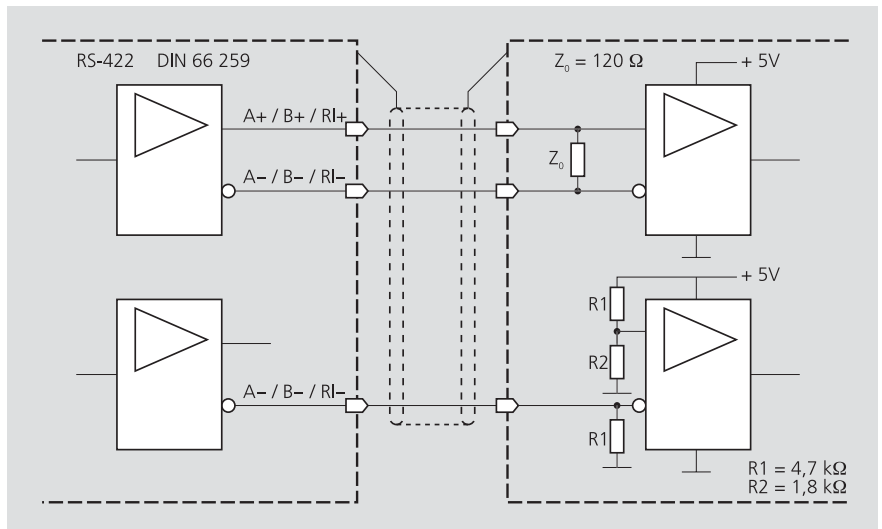
Example: An interpolation factor of 250 yields a signal period of 4 μm . Through a 4-edge evaluation by the control, a resolution of 1 μm results. Integrated interpolation factors after 4 edges:

1 V _{pp}	→	TTL
10 μm	-	25x
5 μm	-	50x
1 μm^*	-	256x
0.25 μm^{**}	-	1024x

$$* \frac{1000}{4 \times 256} = 0.976 \mu m$$

$$** \frac{1000}{4 \times 1024} = 0.244 \mu m$$

Recommended interface circuitry for TTL signals



R1 = 4,7 k Ω
 R2 = 1,8 k Ω

Product Overview and Technical Data

Additional Technical Data

Resolution with TTL signal	0.25**; 1*; 5; 10	μm
Repeatability	2; 2; 5; 10	μm
Interpolation accuracy (at 5V and 20°C)	± 3; 3; 3; 3	μm
Max. travel speed	5 m/s at resolution 5 μm; 10 μm, 1 V _{pp} 1 m/s at resolution 1 μm 0,5 m/s at resolution 0.25 μm	
Vibration (55 – 2000 Hz)	≤ 100 m/s ²	
Shock (11 ms)	≤ 500 m/s ²	
Max. rail length (one-piece)	4000 mm (standard) 4500 mm (special order)	
Enclosure (DIN EN 60529)	IP 67	
Operating temperature	0 to 50°C	
Storage temperature	–10 to 70°C	
Power supply	5 V ^{+5%} _{–3%}	
Power consumption	1 V _{pp} :	250 mA
	TTL 5 μm; 10 μm:	400 mA
	TTL 0.25 μm; 1 μm:	350 mA
Voltage drop (for standard cable/extension cable per 1 m length)		Standard Extension
	1 V _{pp} :	60 mV 20 mV
	TTL 5 μm; 10 μm:	100 mV 30 mV
	TTL 0.25 μm; 1 μm:	80 mV 25 mV

Notes on resolution rates

$$* \frac{1000}{4 \times 256} = 0.976 \mu\text{m}$$

$$** \frac{1000}{4 \times 1024} = 0.244 \mu\text{m}$$

The sinusoidal scanning signal must be interpolated to achieve these resolutions. No external unit is needed for interpolation.

For resolution rates of 0.25 μm, 1 μm, 5 μm and 10 μm, the interpolation unit is integrated in the scanner (sensor). If higher travel speeds are needed for the resolutions 0.25 μm or 1 μm, select a sensor (scanner) with signal type 1V_{pp} and the appropriate external interpolation unit (R1689 840 06 or ...07).

Accuracy of the measuring system

The accuracy of the measuring system is made up of the following components:

- Scale pitch accuracy + guideway accuracy (pitch accuracy)
- Deviation of the interpolation ($\pm 3 \mu\text{m}$)

The sums of the deviations are summarized in the term “system accuracy”.

Definition of pitch accuracy:

The pitch accuracy is the maximum deviation from the mean of any position over a measuring distance of 1m, expressed in $\pm a$ (μm).

Four different pitch accuracies are available:

- $\pm 3 \mu\text{m}$
- $\pm 5 \mu\text{m}$
- $\pm 10 \mu\text{m}$
- $\pm 30 \mu\text{m}$

at 20°C

A detailed **accuracy report** can be provided on request.

For examples, see the following pages.

When ordering:

The pitch accuracy is selected by stating the appropriate code in the guide rail part number.

System accuracy

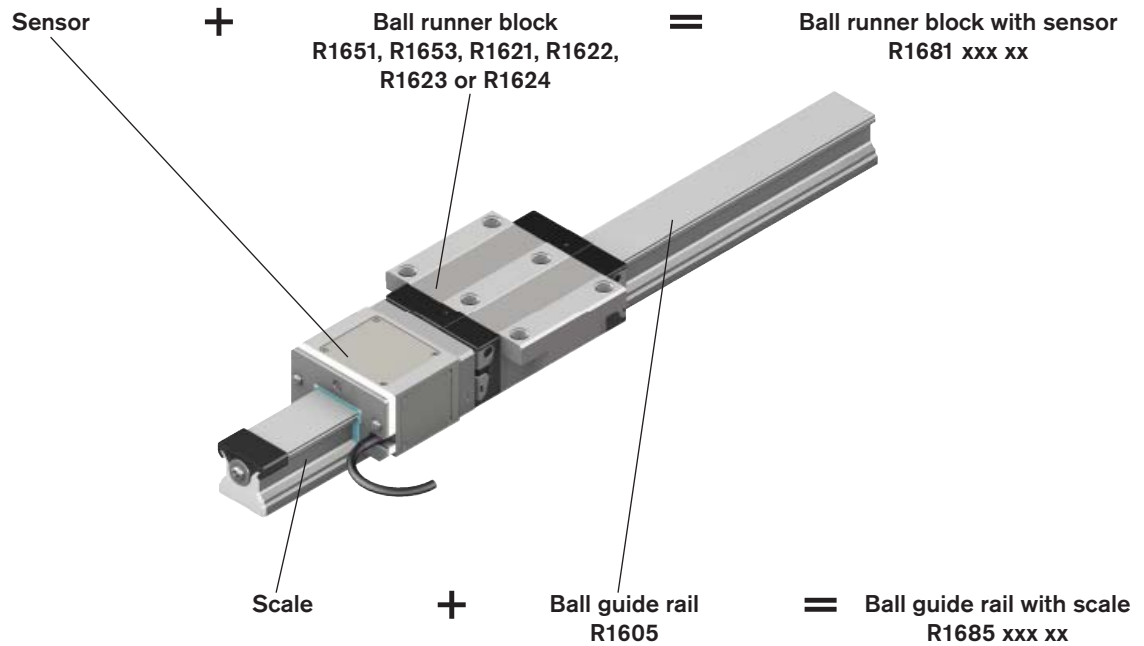
Scale pitch and guideway	Interpolation	System accuracy
$\pm 3 \mu\text{m}$	$\pm 3 \mu\text{m}$	$\pm 6 \mu\text{m}$
$\pm 5 \mu\text{m}$	$\pm 3 \mu\text{m}$	$\pm 8 \mu\text{m}$
$\pm 10 \mu\text{m}$	$\pm 3 \mu\text{m}$	$\pm 13 \mu\text{m}$
$\pm 30 \mu\text{m}$	$\pm 3 \mu\text{m}$	$\pm 33 \mu\text{m}$

Test Report Part 1 and Part 2 (accuracy reports)

<p style="text-align: right;">Rexroth Bosch Group</p> <p style="text-align: center;">Prüfbericht / Inspection Report</p> <p>Kundenauftragsnr. / Customer order no.: Positionsnr. / Position no.: Seriennummer / Serial no.:</p> <p style="text-align: right;">Muster IMS Katalog 8003451</p> <p style="text-align: right;">Datum / Date: 05.10.2005</p>	<p>Messprotokoll / Calibration Chart</p>
<p style="text-align: right;">Rexroth Bosch Group</p> <p>Hersteller-Prüfzertifikat / Manufacturer's Inspection Certificat (DIN 55350-18.4.2.2)</p> <p>Materialnummer / Material no.: R1685 732 11</p> <p>Bezeichnung / Part name: FÜHRUNGSSCHIENE GR.30 STANDARD - IMS</p> <p>Seriennummer / Serial no.: 8003451</p> <p>Schienenlänge / Rail length (mm): 3196</p> <p>FA-Nr. / Production no.: 01779756</p> <p>Kundenauftragsnr.: / Customer order no.: _____</p> <p>Positionsnr.: / Position no.: _____</p> <p>Kunde: / Customer: _____</p> <p>Kundennr.: / Customer no.: _____</p>	<p>Daten zum Messsystem / Measuring system</p> <p>Messlänge: / Measuring length: 3136</p> <p>Messposition: / Measuring position: 0</p> <p>Genauigkeitsklasse: / Accuracy class: +/-3 [µm]</p> <p>Ref.-Marke / Ref. mark (Pos. mm): Rückseitig 220,0 mm</p> <p>Bezugstemperatur: / Nominal temperature: 20°C +/- 0,5°C</p> <p>Kalibrierung normal: / Calibration standard: HP Interferometer 3617A00271</p> <p>Datum: / Date: 05.10.2005</p> <p>Prüfer: / Inspector: Muster IMS Katalog</p> <p>Unterschrift: / Signature: _____</p>
<p>Bei Rückfragen / For Information</p> <p>Bosch Rexroth AG / Abt. SPR Ernst-Sachs-Straße 100 D-97424 Schweinfurt Tel.: / Phone: +49 (0) 9721 / 937-0</p>	

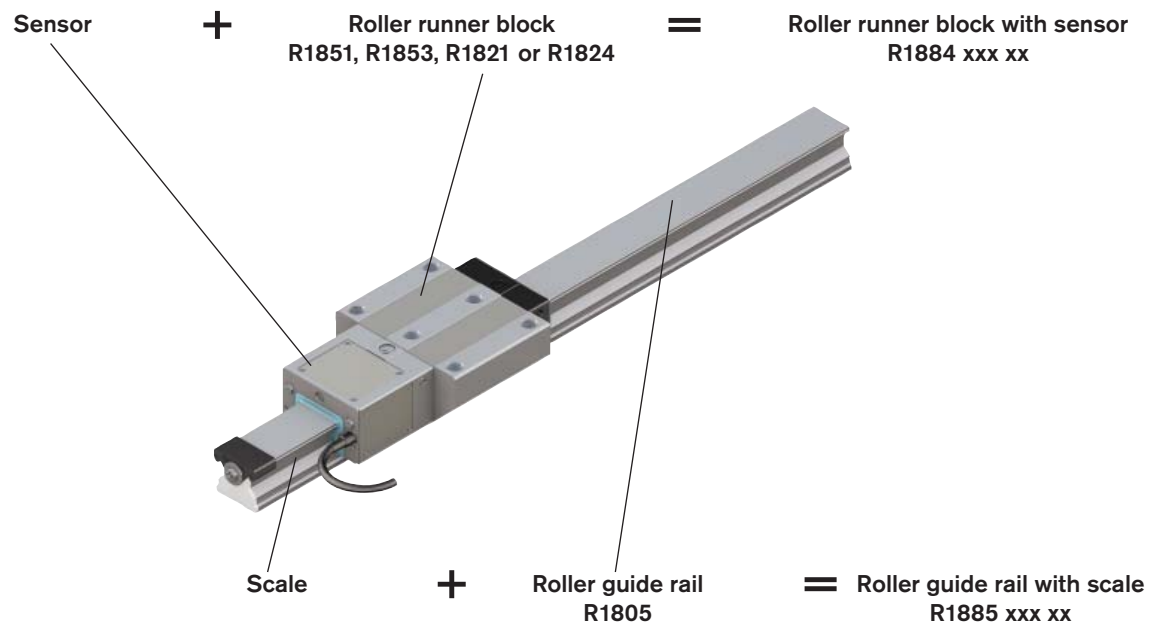
Ordering System

Ball Rail Systems



When Ball Rail Systems are ordered with integrated measuring system, the part number (PN) changes. A ball runner block with PN R1651, R1653, R1621, R1622, R1623 or R1624 is then given the PN R1681 to indicate that the sensor has been mounted. A similar procedure is followed when ordering the ball guide rail. The PN changes from R1605 to R1685 to indicate that the scale has been incorporated.

Roller Rail Systems



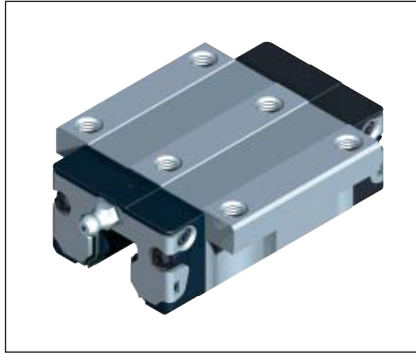
When Roller Rail Systems are ordered with integrated measuring system, the part number (PN) changes. A roller runner block with PN R1851, R1853, R1821 or R1824 is given the PN R1884 to indicate that a sensor has been mounted. A similar procedure is followed when ordering the roller guide rail. The PN changes from R1805 to R1885 to indicate that the scale has been incorporated.

Integrated Measuring System for Ball Rail Systems

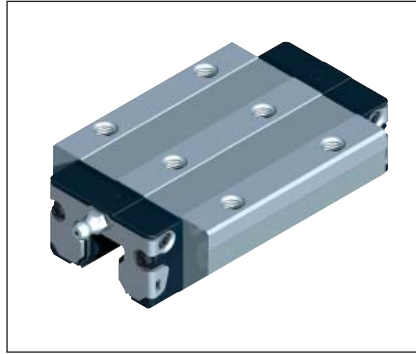
Steel Ball Runner Blocks

Preload C2 (8% C)
Accuracy class P

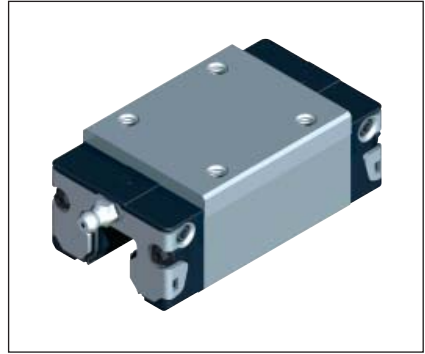
Flanged, normal, standard height FNS
R1651 ...



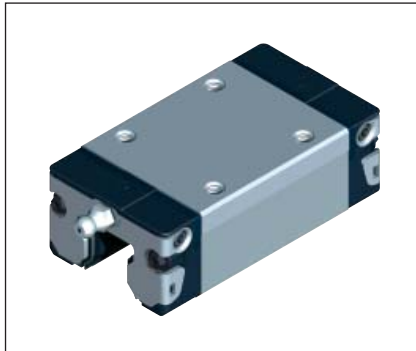
Flanged, long, standard height FLS
R1653 ...



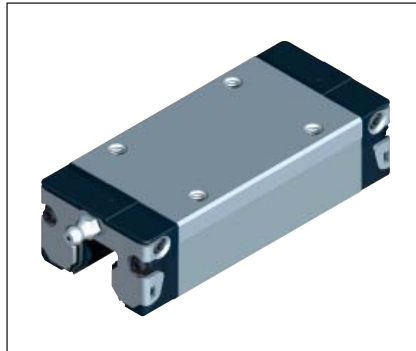
Slimline, normal, high SNH
R1621 ...



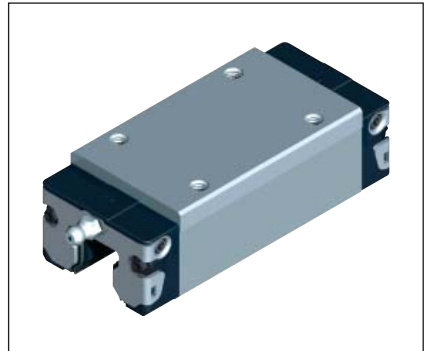
Slimline, normal, standard height SNS
R1622 ...



Slimline, long, standard height SLS
R1623 ...



Slimline, long, high SLH
R1624 ...



The part number is composed
as follows:

R 16 x x x 2 2 x x

Runner block version
 Flanged, normal, standard height... = 51
 Flanged, long, standard height..... = 53
 Slimline, normal, high * = 21
 Slimline, normal, standard height... = 22
 Slimline, long, standard height = 23
 Slimline, long, high * = 24

* not in size 20

Note:
Please refer to the sections
"Ordering System" and
"Order Examples".

20 = Without ball chain
 22 = With ball chain
 2 = Accuracy class P
 2 = Preload C2 (8% C)
 Size
 8 = 20
 2 = 25
 7 = 30
 3 = 35
 4 = 45

Scanner Options

Mounting side		Signal type and resolution					Cable length ¹⁾	Connector ²⁾		Enclosure	
Reference edge on runner block		1 V _{pp}	TTL (μm)				max. 3000 mm	12-pin Connei		IP 67	IP 67 plus ³⁾
Scale Reference edge at top	Scale Reference edge at bottom		0.25	1	5	10	Preferred length 1000 mm	Con- nector male con- tacts	Coup- ling male con- tacts		
01	02	01	02	03	04	05	...	01	02	01	02

1) For cable length 3 m: voltage drop of 0.3 V

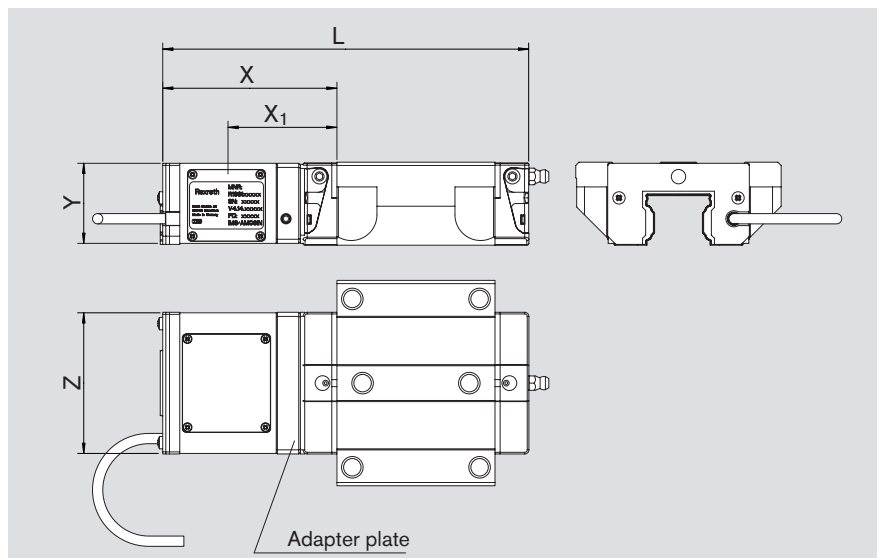
2) For precise details of connectors, see the section on Connectors and Cables.

3) IP 67 and resistant to metalworking fluids (tested with Curtis S90)

Recommendation for cable lengths: For cable lengths > 1 m, use extension cable R1689 840 03.

Dimensions of ball runner block with integrated measuring system

The probe is mounted on an adapter plate to allow removal of the scanner from the runner block.



Size	Dimensions (mm)					
	L ⁵⁾	L ⁶⁾	X	X ₁ ⁴⁾	Y	Z
20	145.7	161.7	82.5	50.0	24.9	43.0
25	155.6	177.3	82.7	51.0	29.4	47.0
30	166.4	188.4	82.7	52.0	34.0	58.5
35	179.5	208.0	84.9	53.8	39.0	68.5
45	206.7	243.2	88.4	56.9	48.5	83.0

4) X₁: Position of the reference sensor in the scanner

5) For ball runner blocks FNS, SNH, SNS

6) For ball runner blocks FLS, SLS, SLH

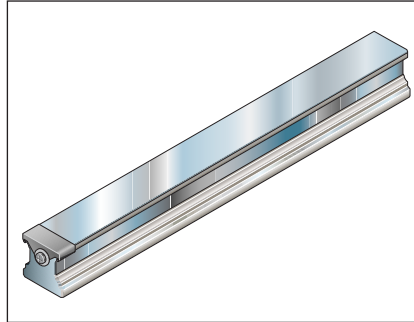
Ball Guide Rails with Measuring System

Steel Ball Guide Rails

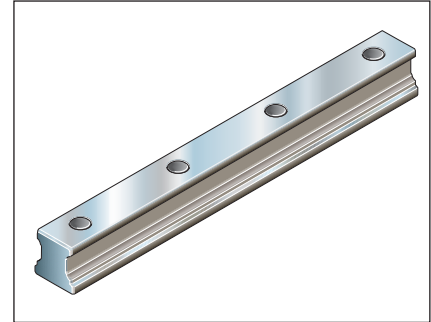
top-mount

Accuracy class P

with cover strip and protective end caps R1605 . 6 2 . 1



with plastic mounting hole plugs R1605 . 0 2 . 1



The part number is composed as follows:

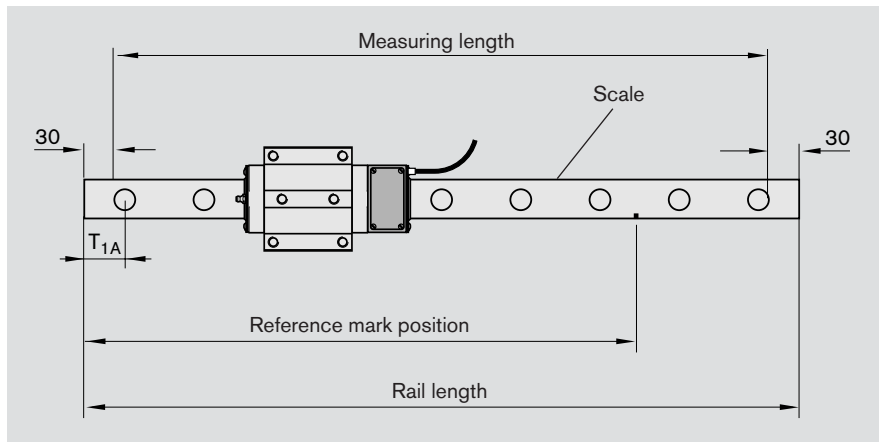
R1605		x x x		x 1	
Top-mount version				1 =	Code for no. of sections (one-piece)
Size				62 3 =	Guide rail with cover strip Size 20 – 30 Accuracy class P
20	= 8			62 6 =	Guide rail with cover strip Size 35 – 45 Accuracy class P
25	= 2			02 3 =	Guide rail with mounting hole plugs, all sizes
30	= 7				
35	= 3				
45	= 4				

Note:
Please refer to the sections "Ordering System" and "Order Examples".

Scale Options

Reference mark (n)			Scale pitch accuracy				Rail length	Reference mark position	T _{1A}
without	single	distance coded	± 3	± 5	± 10	± 30	max. 4000 mm	For single reference mark only	(for asymmetrical rail ends)
00	01	02	01	02	03	04

Additional ordering data for single reference mark

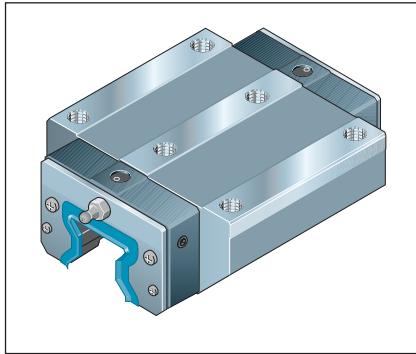


Integrated Measuring System for Roller Rail Systems

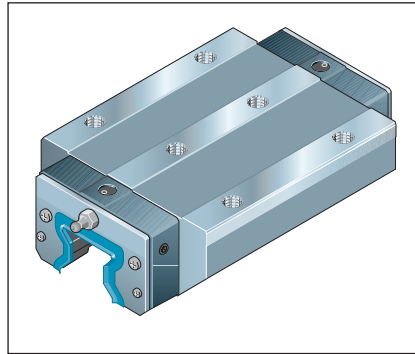
Steel Roller Runner Blocks

Preload C2 (8%) / C3 (13%)
Accuracy class SP

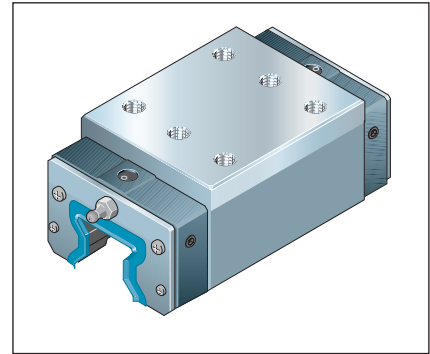
Flanged, normal, standard height FNS
R1851 ...



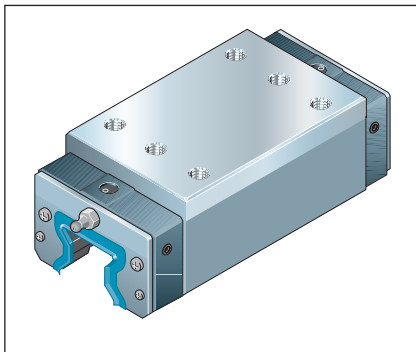
Flanged, long, standard height FLS
R1853 ...



Slimline, normal, high SNH
R1821 ...



Slimline, long, high SLH
R1824 ...



The part number is composed as follows:

R 18 x x x x 1 1 0

Runner block version	
Flanged, normal, standard height...	= 51
Flanged, long, standard height.....	= 53
Slimline, normal, high	= 21
Slimline, long, high.....	= 24

1 = Accuracy class SP

Preload

2 = C2 (8% C)

3 = C3 (13% C)

Size

3 = 35

4 = 45

5 = 55

6 = 65

Note:

Please refer to the sections "Ordering System" and "Order Examples".

Scanner Options

Mounting side		Signal type and resolution					Cable length ¹⁾	Connector ²⁾		Enclosure	
Reference edge on runner block		1 V _{pp}					max. 3000 mm	12-pin Connei		IP 67	IP 67 plus ³⁾
Scale	Scale	0.25	1	5	10	Preferred length 1000 mm	Connector male contacts	Coupling male contacts			
Reference edge at top	Reference edge										
01	02	01	02	03	04	05	...	01	02	01	02

1) For cable length 3 m: voltage drop of 0.3 V

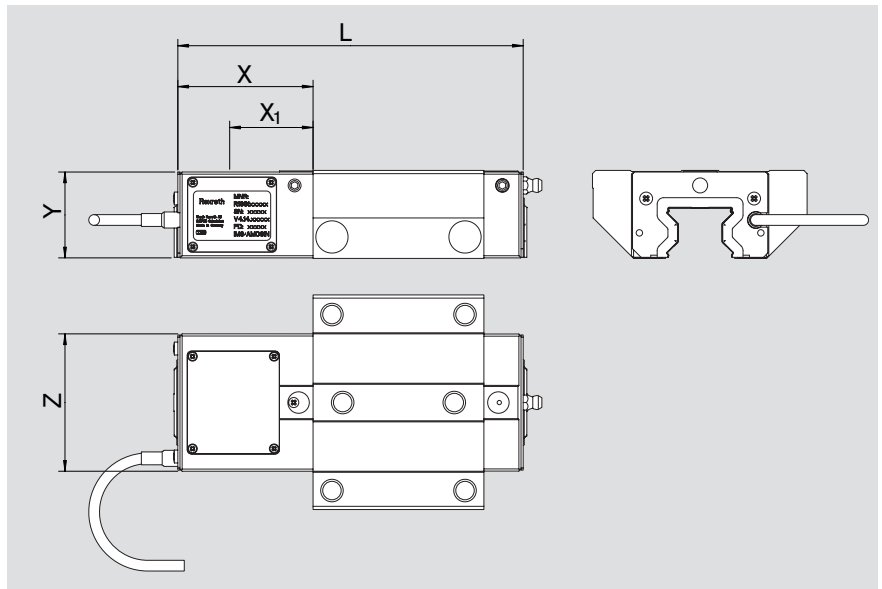
2) For precise details of connectors, see the section on Connectors and Cables.

3) IP 67 and resistant to metalworking fluids (tested with Curtis S90)

Recommendation for cable lengths: For cable lengths > 1 m, use extension cable R1689 840 03.

Dimensions of roller runner block with integrated measuring system

The roller recirculation element is integrated in the probe.



Size	Dimensions (mm)					
	L ⁵⁾	L ⁶⁾	X	X ₁ ⁴⁾	Y	Z
35	161.3	185.3	63.0	38.9	40.0	64.0
45	190.3	222.8	67.0	41.7	50.0	78.0
55	219.3	258.3	72.0	44.5	56.3	91.5
65	265.5	313.5	87.0	55.5	75.1	119.0

4) X₁: Position of the reference sensor in the scanner

5) For roller runner blocks FNS, SNH

6) For roller runner blocks FLS, SLH

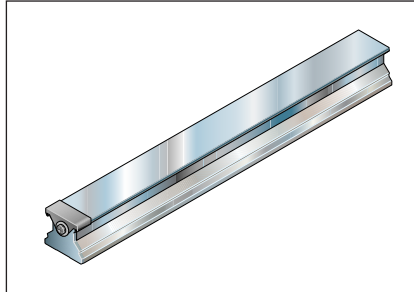
Roller Guide Rails with Measuring System

Steel Roller Guide Rails

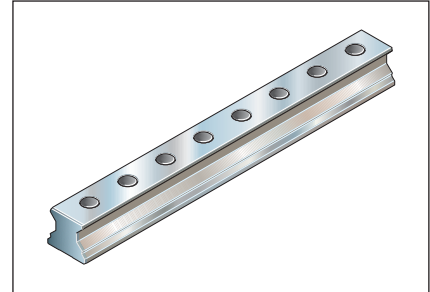
top-mount

Accuracy class P

with cover strip and protective end caps R1805 . 6 2 3 1



with plastic mounting hole plugs R1805 . 5 2 3 1



The part number is composed as follows:

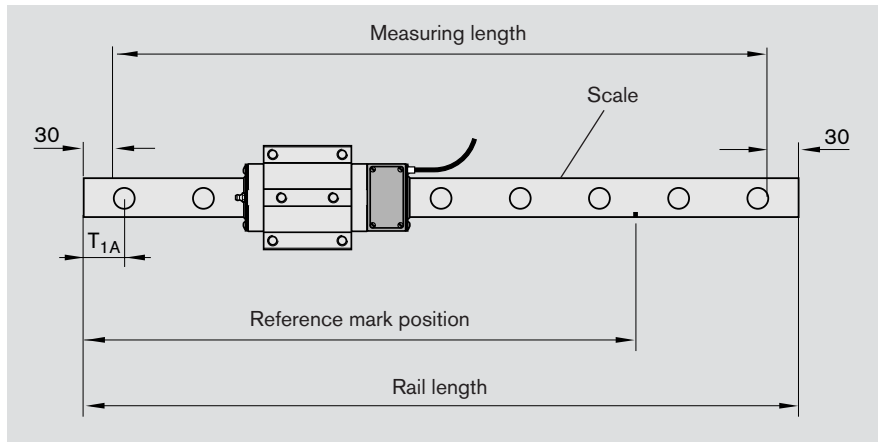
	R1805	x	x	x	x	1	
Top-mount version							1 = Code for no. of sections (one-piece)
Size							52 3 = Guide rail with mounting hole plugs Accuracy class P
35							62 3 = Guide rail with cover strip Accuracy class P
45							
55							
65							

Note:
Please refer to the sections "Ordering System" and "Order Examples".

Scale Options

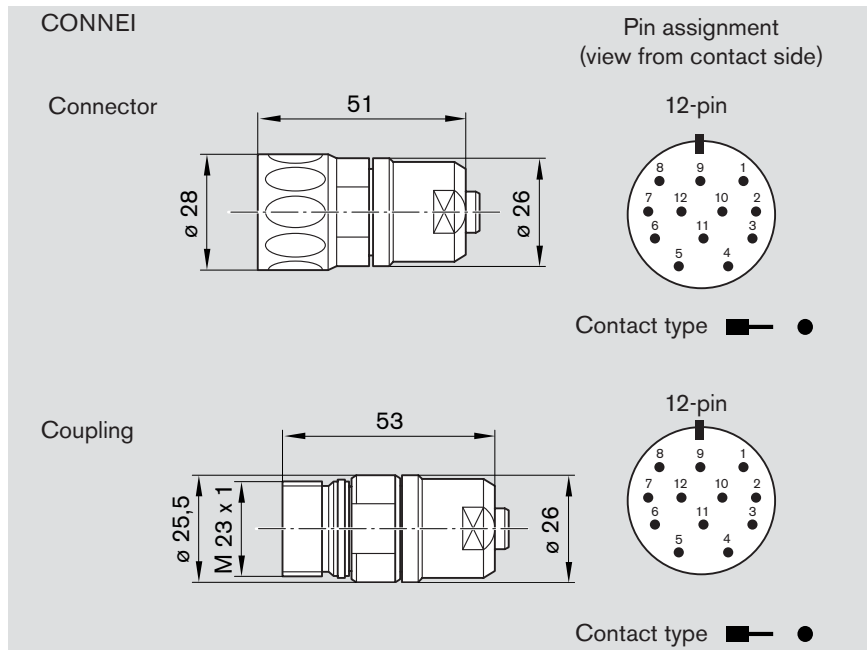
Reference mark (n)			Scale pitch accuracy				Rail length	Reference mark position	T _{1A}
without	single	distance coded	± 3	± 5	± 10	± 30	max. 4000 mm	For single reference mark only	(for asymmetrical rail ends)
01	02	03	01	02	03	04

Additional ordering data for single reference mark



Connectors

Standard



12-pin Connei (IP66)		
Pin no.	Color	Signal assignment
1	white	B-
2	red-white	5V sensor
3	pink	RI+
4	gray	RI-
5	green	A+
6	yellow	A-
7	-	-
8	brown	B+
9	-	-
10	blue	0V
11	blue-white	0V sensor
12	red	+5V
-	Shield	Enclosure
-	black	-
-	violett	-

Cables

Wire Assignment

Color assignment for standard cable (on scanner)

PUR cable, black

Cable structure

Cores: 5 x (2 x 0.05 mm²) + (2 x 0.14 mm²)

Shield: braided, galvanized, high-conductivity Cu wire – coverage approximately 85%

Sheath: PUR

Color: black

Outside diameter: 5.0 ± 0.15 mm

Mechanical properties (standard cable)

Bending radius for one-time bending (stationary): 5 x d (cable outside diameter)

Bending radius for repeated bending (flexing installation): 10 x d

Processing and operating temperature: -30°C to max. +90°C

Shipping and storage temperature: -40°C to max. +90°C

Chemical properties (standard cable)

Oil resistant per VDE 0472 part 803 test type B

Halogen-free per VDE 0472 part 815

Flame-retardant

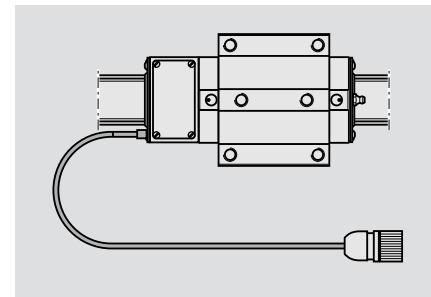
Generally resistant to acids, alkalis, and cleaning solutions

Generally resistant to dust (e.g. bauxite, magnesite)

Generally resistant to microbe and fungus infestation


Accessories (on request)

- Digital display unit
- External interpolation unit
- Precision sinusoidal amplifier
- TTL/HTL adapter
- Extension cable





Mounting Instructions

Mounting and Removal of Runner Blocks

 Always handle the measuring system with great care!

Mounting options

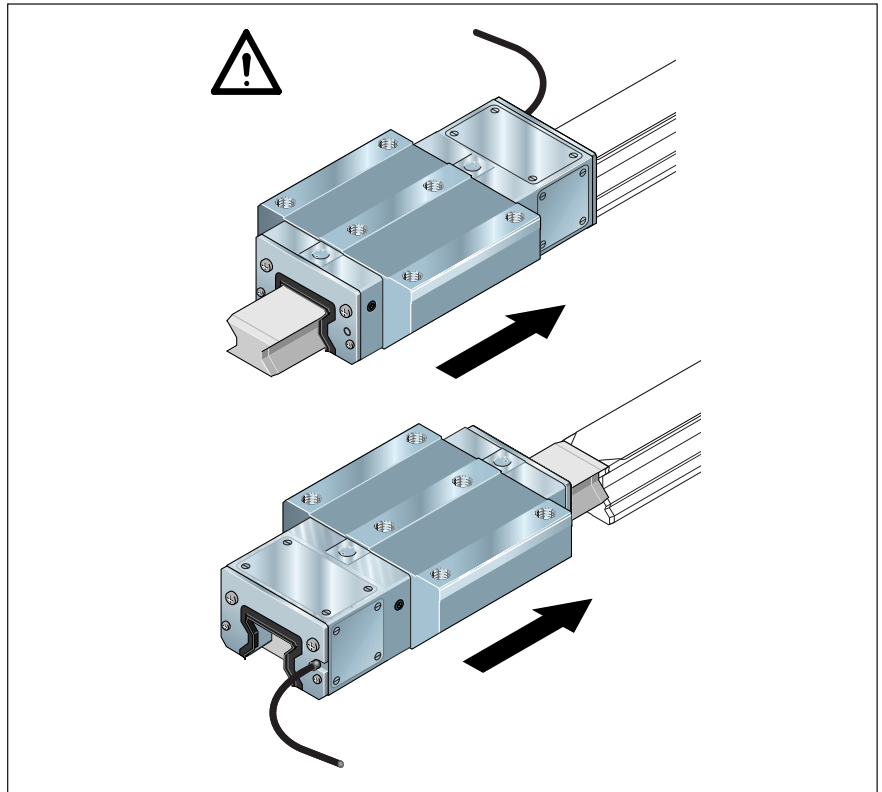
 If the runner block must be pushed onto the guide rail scanner-end first, use extreme care!

 For roller runner blocks: The mounting arbor must remain in the runner block until the block is pushed onto the guide rail. Otherwise, rollers may be lost!

- Push the runner block carefully onto the guide rail.

For roller runner blocks:

- Position the runner block on its mounting arbor against the end of the guide rail and carefully push the runner block off the mounting arbor and onto the guide rail.




Removal

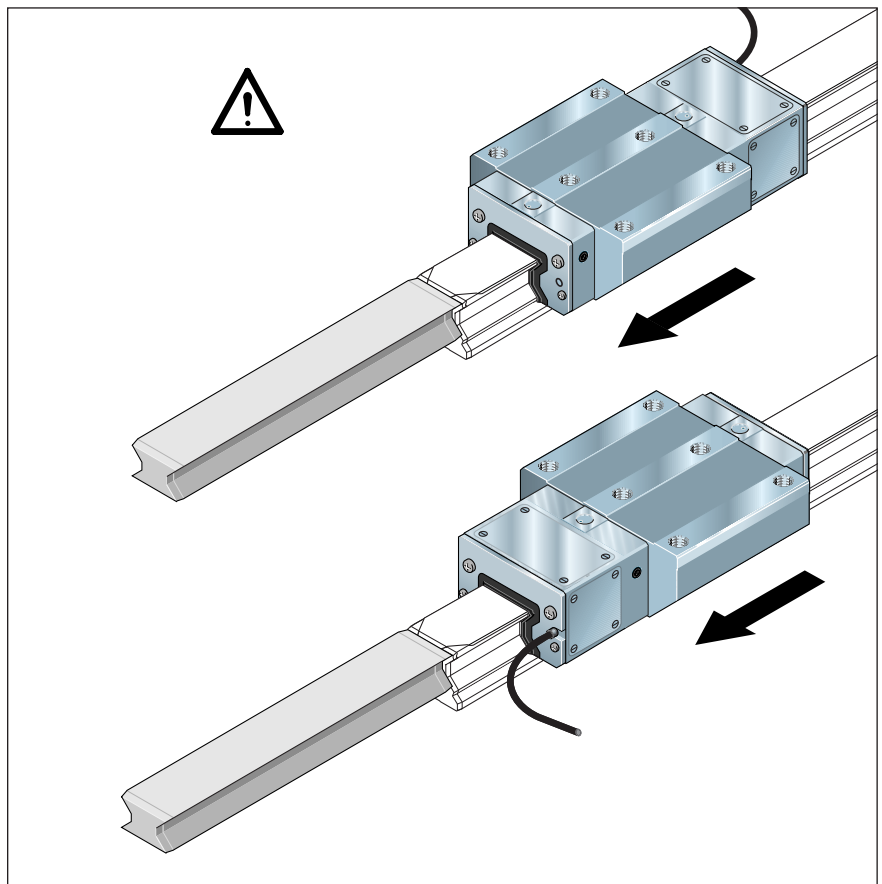
 If the runner block cannot be removed scanner-end first, use extreme care!

- Carefully slide the runner block off the guide rail.

For roller runner blocks:

 The removed roller runner block must remain on the mounting arbor! Otherwise, rollers may be lost!

- Always slide the runner block directly off the guide rail and onto the mounting arbor!



Mounting Instructions

Mounting the guide rails

! Always handle the measuring system with great care!

To ensure that the repeatable accuracy of the measuring system is achieved upon assembly, the guide rails must be screwed down in sequence from the ends toward the center. Partial sections should be screwed down in the same way.

For more detailed information on assembling Ball Rail and Roller Rail Systems, as well as cover strips, see the following mounting instructions:

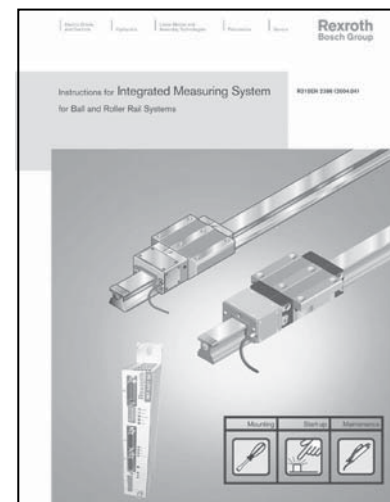
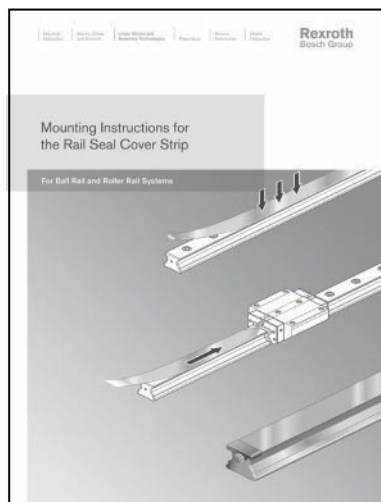
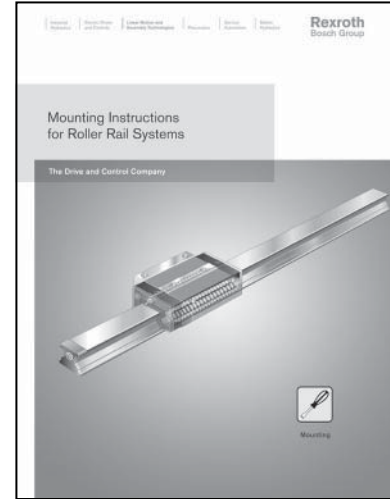
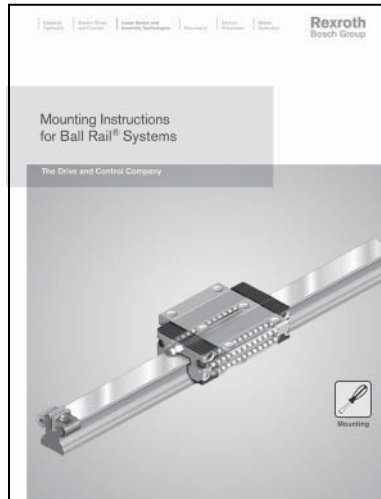
Screw installation sequence (example)



Note:

For guide rails with distance coded reference marks, the side with the reference marks is indicated by a hole

in the reference edge of the guide rail (see page 7). The scale is located on the opposite side.



Maintenance Instructions

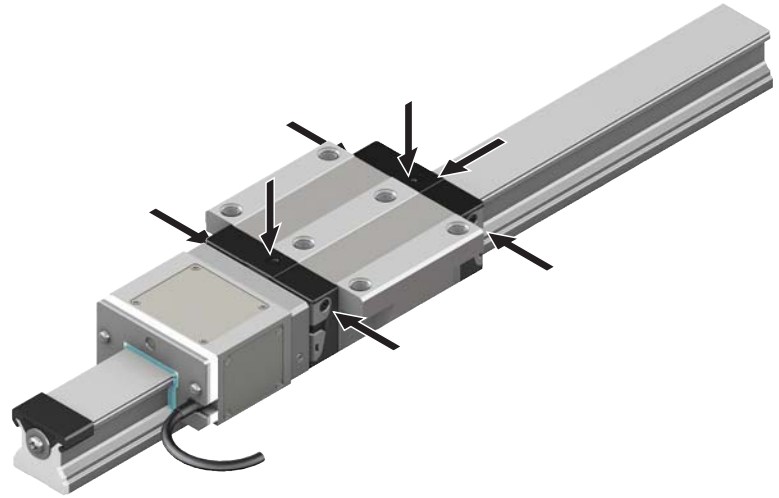
Lubrication

Ball Rail and Roller Rail Systems with Measuring System cannot be lubricated through the scanner.

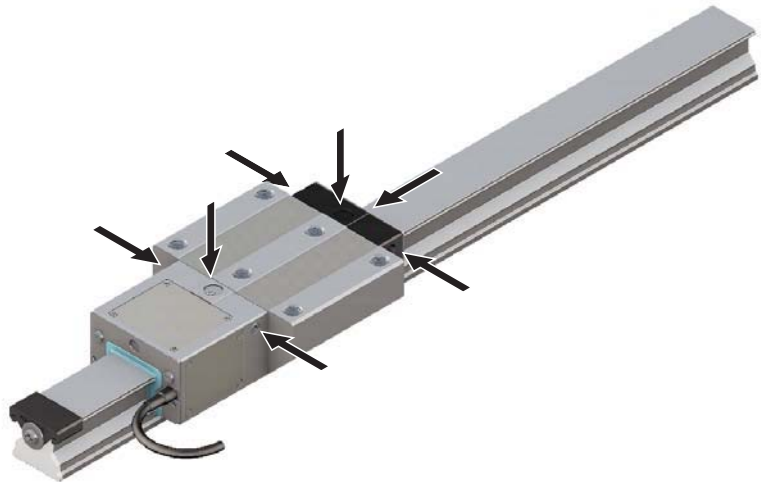
The runner blocks can be easily lubricated using the free lube ports.

For more information on maintenance and lubrication, see the respective sections in the Ball Rail Systems catalog or the Roller Rail Systems catalog.

Lubrication of Ball Rail Systems



Lubrication of Roller Rail Systems



Safety notes

See "Instructions for Integrated Measuring System for Ball Rail and Roller Rail Systems" (R310EN 2386/2004-04).

Order Examples

Integrated Measuring System for Ball Rail Systems

Ball Runner Block

Ordering data		Description
IMS-RB	R1681	Ball runner block with integrated measuring system
Runner block	= R1651 722 20	Ball runner block FNS size 30, accuracy class P, preload C2, without ball chain
Mounting side	= 01	Reference edge of runner block at top
Signal type	= 03	TTL with 1 μm resolution
Cable length	= 1000	Cable length 1000 mm
Connector	= 01	12-pin Connei connector with male contacts
Enclosure	= 01	Enclosure protection class IP 67

Ball Guide Rail

Ordering data		Description
IMS-GR	R1685	Ball guide rail with integrated measuring system
Guide rail	= R1605 762 31	Ball guide rail with cover strip and protective end caps, size 30, accuracy class P
Reference mark	= 01	Single reference mark
Accuracy	= 03	Scale pitch accuracy $\pm 10 \mu\text{m}$
Rail length	= 3836	Rail length 3836 mm
Reference mark position	= 1700	Reference mark position: 1700 mm from end face of rail
T _{1A}	= -	T _{1A} : symmetrical spacing

Integrated Measuring System for Roller Rail Systems

Roller runner blocks

Ordering data		Description
IMS-RB	R1884	Roller runner block with integrated measuring system
Runner block	= R1851 431 10	Roller runner block size 45, accuracy class SP, preload C3 (13%)
Mounting side	= 01	Reference edge of runner block at top
Signal type	= 03	TTL with 1 μm resolution
Cable length	= 1000	Cable length 1000 mm
Connector	= 01	12-pin Connei connector with male contacts
Enclosure	= 01	Enclosure protection class IP 67

Roller guide rail

Ordering data		Description
IMS-GR	R1885	Guide rail with integrated measuring system
Guide rail	= R1805 462 61	Roller guide rail with cover strip and protective end caps, size 45, accuracy class P
Reference mark	= 01	Single reference mark
Accuracy	= 03	Scale pitch accuracy $\pm 10 \mu\text{m}$
Rail length	= 3836	Rail length 3836 mm
Reference mark position	= 1700	Reference mark position: 1700 mm from end face of rail
T _{1A}	= -	T _{1A} : symmetrical spacing

Inquiry/Order Form

Bosch Rexroth Corporation
 14001 South Lakes Drive
 Charlotte, NC 28273

Telephone 704-583-4338 or
 800-438-5983
Telefax 704-583-0523

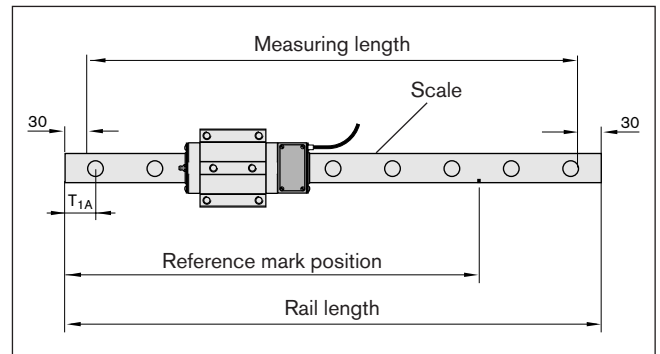
To be completed by customer: Inquiry / Order

Runner block with integrated measuring system

IMS-RB	
Runner block	
Mounting side	
Signal type	
Cable length	
Connector	
Enclosure	

Guide rail with integrated scale

IMS-GR	
Guide rail	
Reference marks	
Accuracy (scale pitch)	
Rail length	
Reference mark position	
T _{1A}	



Quantity Order of _____ pcs; _____ per month, _____ per year, per order, or _____

Comments:

From

Company:

Contact:

Address:

Department:

.....

Telephone:

.....

Telefax:

Bosch Rexroth Corporation
Linear Motion and
Assembly Technologies
14001 South Lakes Drive
Charlotte, NC 28273
Telephone (800) 438-5983
Facsimile (704) 583-0523
www.boschrexroth-us.com

Bosch Rexroth Corporation
Corporate Headquarters
5150 Prairie Stone Parkway
Hoffman Estates, IL 60192-3707
Telephone (847) 645-3600
Facsimile (847) 645-6201

Bosch Rexroth Corporation
Industrial Hydraulics
2315 City Line Road
Bethlehem, PA 18017-2131
Telephone (610) 694-8300
Facsimile (610) 694-8467

Bosch Rexroth Corporation
Electric Drives and Controls
5150 Prairie Stone Parkway
Hoffman Estates, IL 60192-3707
Telephone (847) 645-3600
Facsimile (847) 645-6201

Bosch Rexroth Corporation
Pneumatics
1953 Mercer Road
Lexington, KY 40511-1021
Telephone (859) 254-8031
Facsimile (859) 281-3491

Bosch Rexroth Corporation
Mobile Hydraulics
1700 Old Mansfield Road
Wooster, OH 44691-0394
Telephone (330) 263-3300
Facsimile (330) 263-3333