

Bosch Rexroth AG



BUSINESS UNIT LINEAR MOTION TECHNOLOGY



Ball Rail System Compact Line

Organisation and personal introduction



Kristina Halbe, Newcomer at Bosch Rexroth LT

Responsible for Ball rail systems

Ms Kristina Halbe

Product Manager Profiled Ball Rail Systems
Linear Motion Technology Business Unit

Ball Rail System Compact Line

Organisation and personal introduction



Mr Knut Werner

Product Manager Miniature Ball Rail Systems
Linear Motion Technology Business Unit

“Total Customer Satisfaction”

Responsible for Application Profiled Guides

BSCCL Introduction

Ball Rail System Compact Line

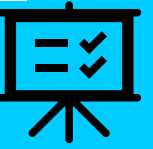
Ms Kristina Halbe, DC-LT/PRM-L

Mr Knut Werner, DC-LT/PRM-L

18th of April 2023

AGENDA

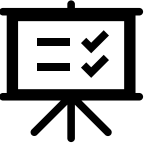
- 1. Overview**
- 2. Strategy**
- 3. Technical details**
- 4. Accessories**
- 5. Comparison BSHP-BSCL**
- 6. Competitor comparison**



Overview

Overview

Current situation & Mission

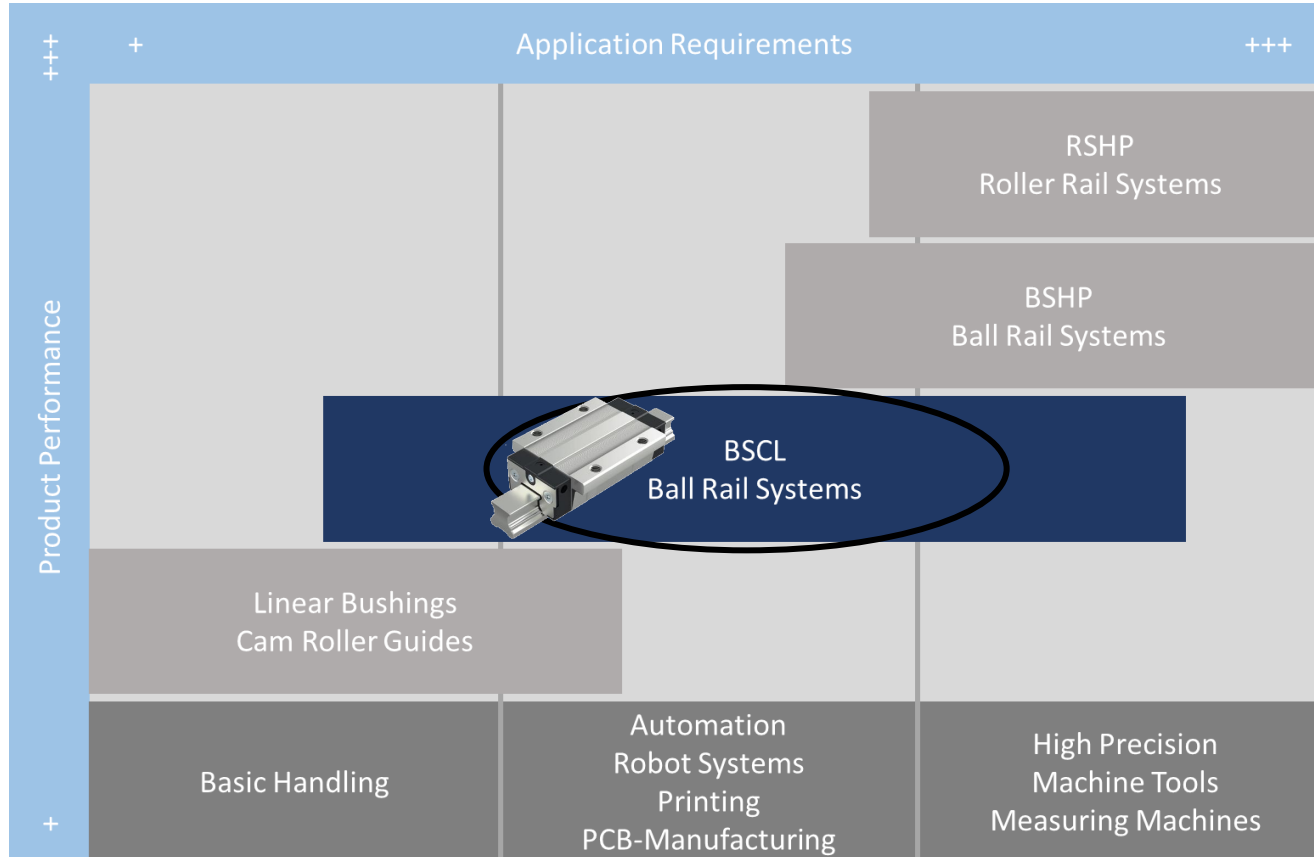
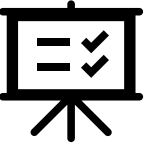


- Currently produced in XiP and sold in Asia, only
- Over 50 % of ball rail systems in China are sold as BSCL linear guides

Mission:
Roll out of the BSCL in RoW

Overview

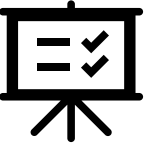
Cluster – Linear Guides



- Application-oriented performance for mid range sector
- Economical ball rail system for a wide range of applications
- **Mid performance product** with typical Bosch quality
- BSCl closes the gap between basic and high performance

Overview

BSCl technical data



Technical data:

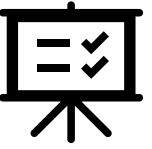
- Dynamic load ratings: up to 79.200 N
- Maximum speed: up to 5 m/s
- Maximum acceleration: up to 500 m/s²
- Lubrication: oil/grease
- Relubrication intervals up to 5.000 km
- Operating temperature: -10 °C to +80 °C

Advantages

- BSCl completes the existing range of Ball Guides
- Provides application-specific performance for the MPP segment
- Performance fits perfectly to Automation and Handling (supports FAst target industry sectors)
- Competitive price-performance-ratio
- Interchangeability
- Greased at factory

Overview

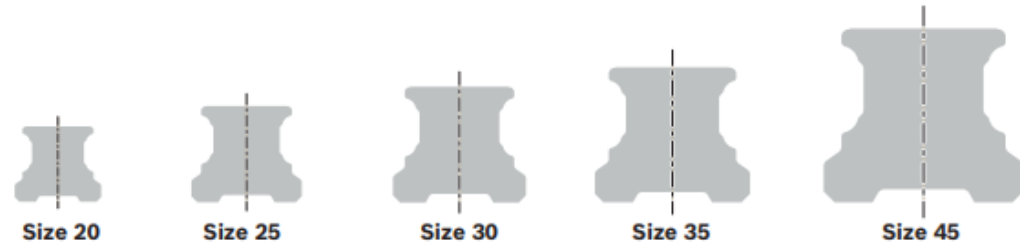
BSCl at a glance



- **6 types**



- **5 sizes (20-45)**



- **3 pre-load classes**

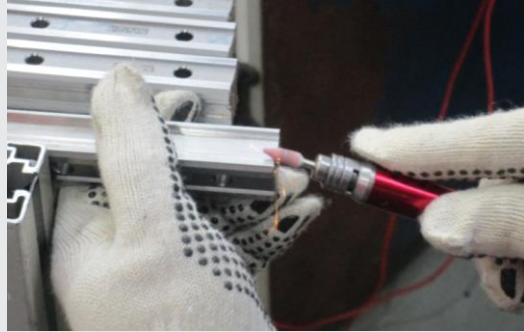
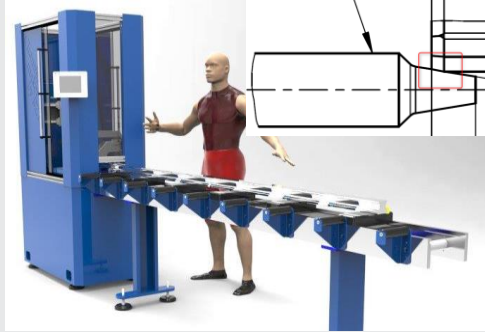

C0 (without preload), C1 (moderate preload), C2 (medium preload)

- **3 accuracy classes**

N (normal), H (high), P (precision)

Overview

Customization – only deburring needed!

Options	Manual Chamfering	Chamfer with milling machine	Brushing
Machine / tool	Hand grinder	Existing CNC chamfering machine	Brushing machine
Picture			

- Manually deburring of the rail possible
 - End machining can be made without expensive production facilities (max. 1000 €)
- **Best suitable for our Partners!**



Strategy

Strategy

Gain of profitable MPP market share



▪ **New Business**

- Compete against HIWIN (HGW-series) and THK (ct-series), PMI, CPC ...
- Customer inquiries which could not be quoted yet, due to price reasons
- Aim at applications with lower technical demands
- Also suitable for partners and distributors (deburring only)

▪ **Existing Business**

- Avoid cannibalization of profitable BSHP business
- Loss makers: Check substitution of BSHP (respecting available sizes and/or accuracy classes/pre-load classes)

Strategy

Conditions



- **In general, no special (customized) solutions**
 - If customization/special machining is necessary, then take BSHP
 - No coatings

- **What must be considered changing from BSHP to BSCL (technically)?**
 - Rigidity
 - Re-lubrication intervals – Mounting Orientation
 - Load capacity
 - Sealing function
 - Speed/acceleration
 - Environment

Strategy

Examples for Applications

- **General Machine Tools**
- **Wood Working Machines**
- **Assembly and Handling**
 - Packaging
 - Automation – Feeding
 - Solar – Handling
 - Loading /Unloading
 - Systems and Axes
- **Machines for Window manufacturing/Subordinate Axes**



Strategy

Sample box - R205N 240 01



Includes:

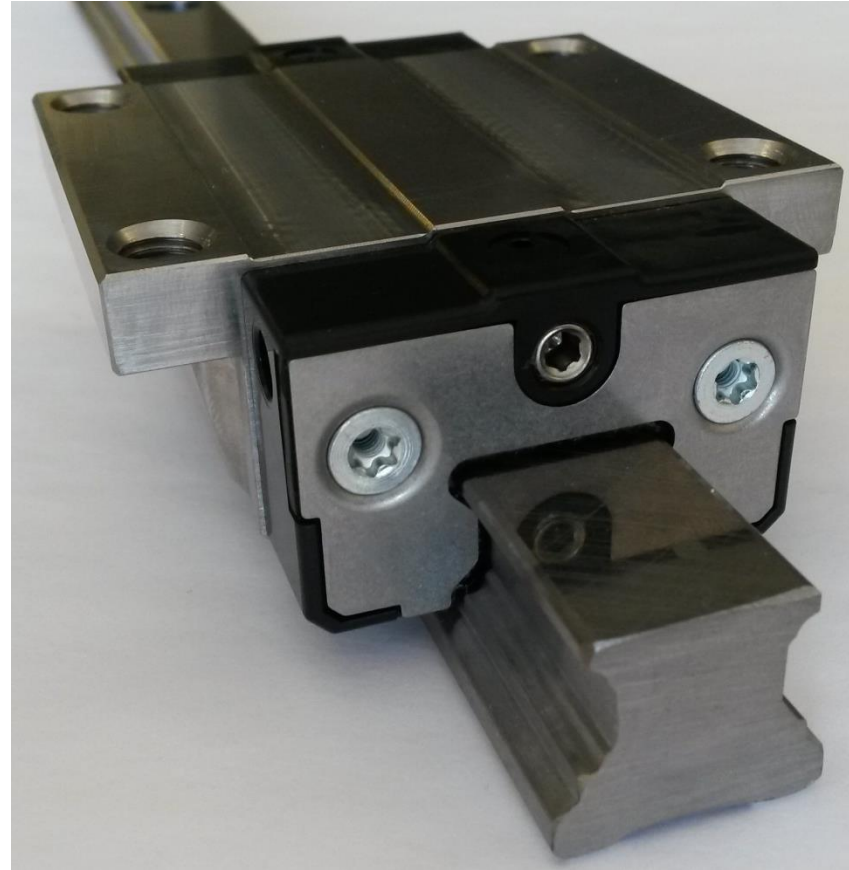
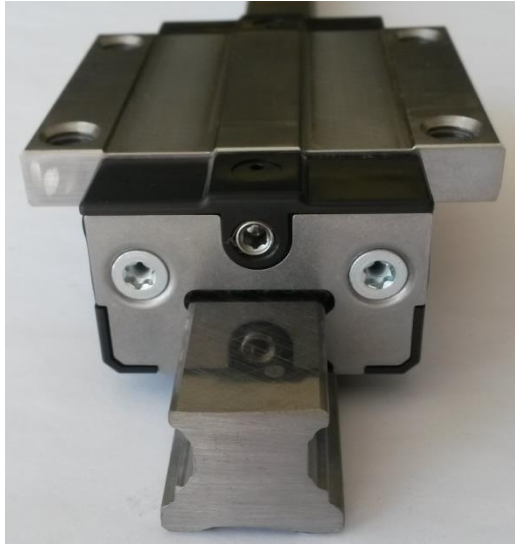
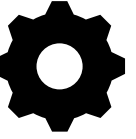
- Rail (length 180 mm)
- Runner block (FNS, size 25)
- Transportation lock



Technical details

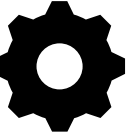
Technical details

Pictures



Technical details

QR- Code



Runner block with QR code

- Material number
- Type (short description)

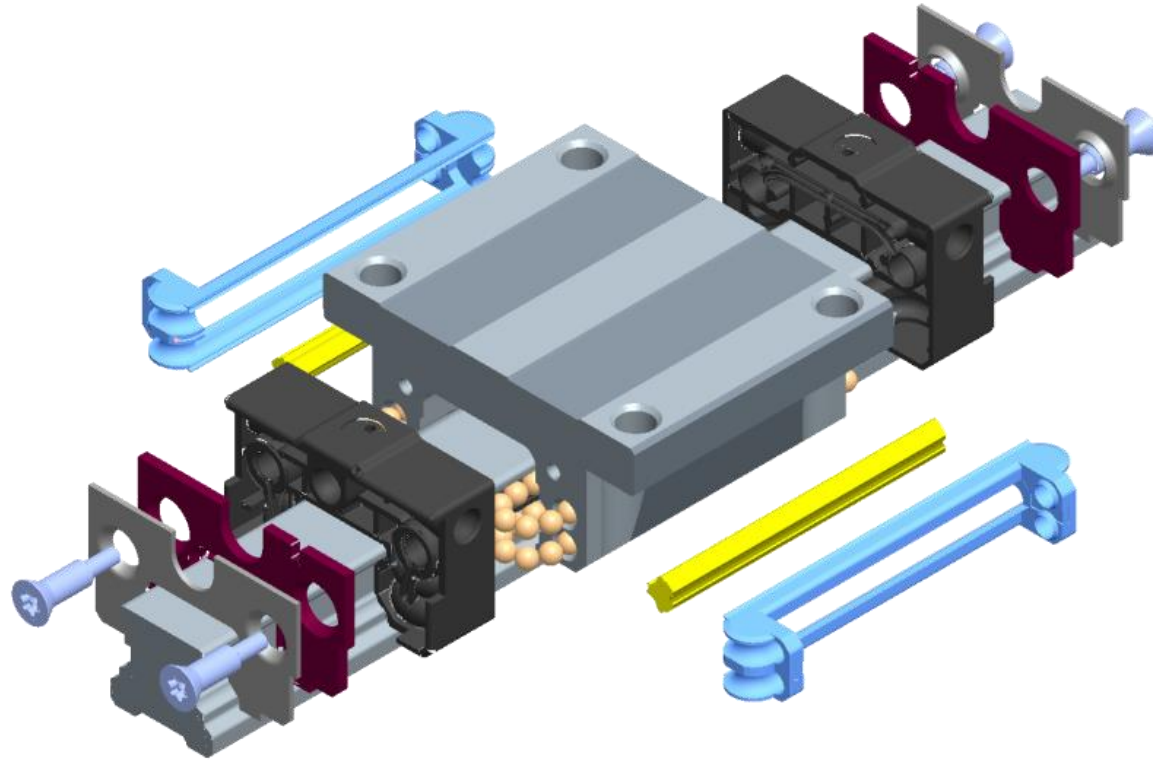
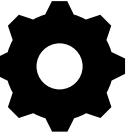
Coming soon:

- Homepage
- Type (short description)
- Manufacturing number
- Manufacturing date
- Manufacturing plant



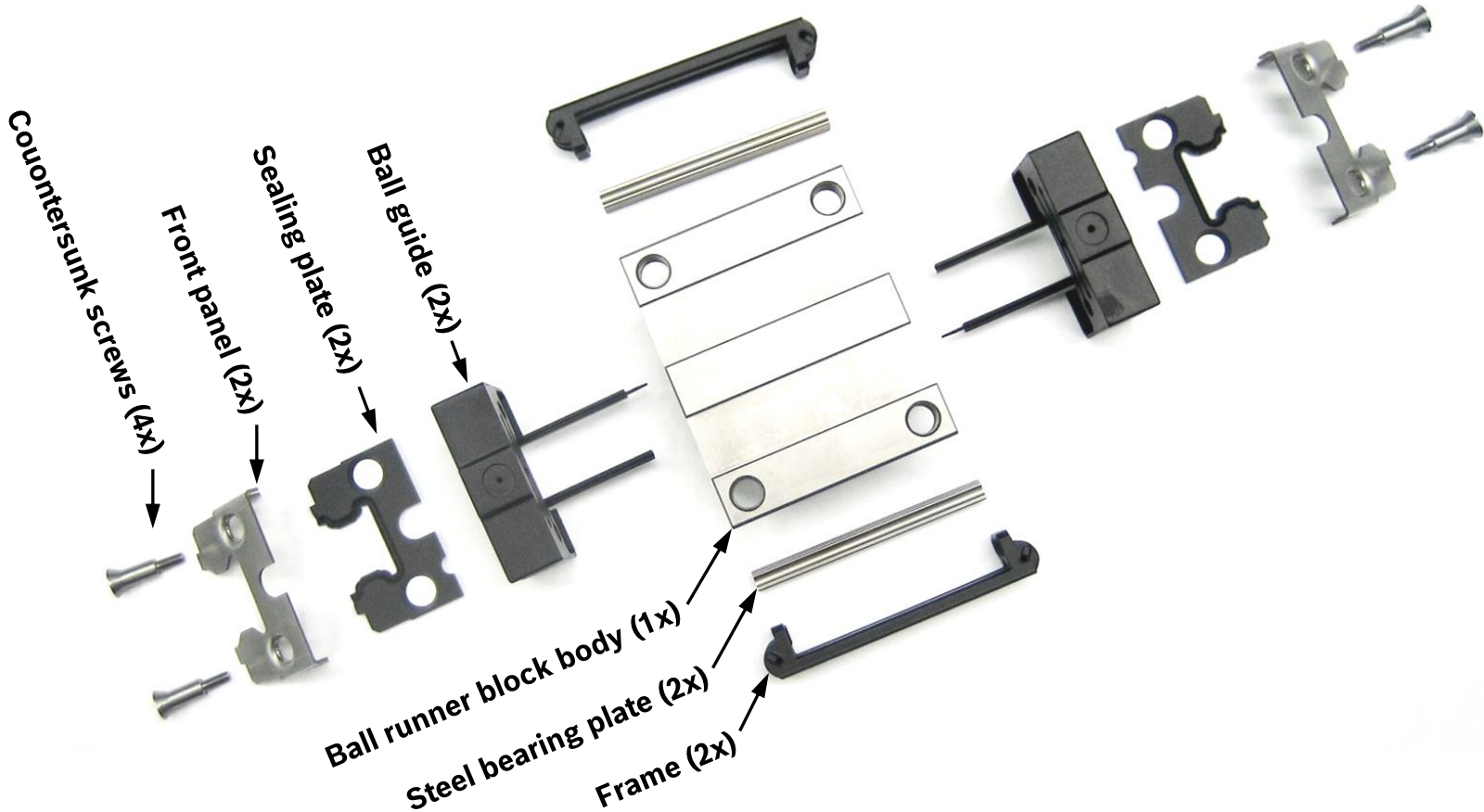
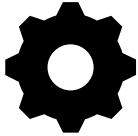
Technical details

Design – with HP Technology



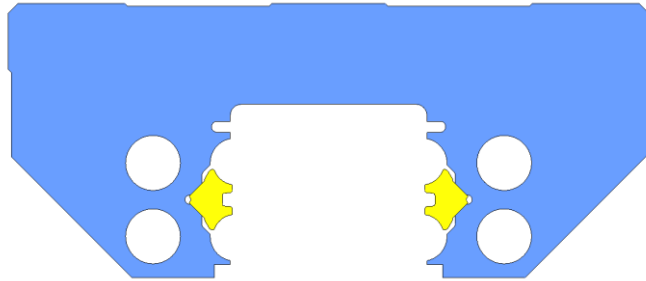
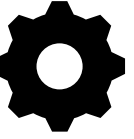
Technical details

BOM-BSCL – Only 15 Single Parts

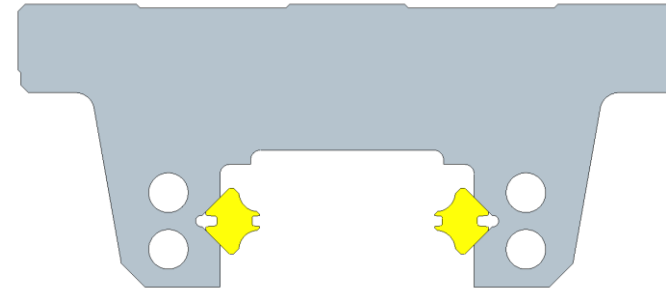


BSCL- Properties

Steel Insert

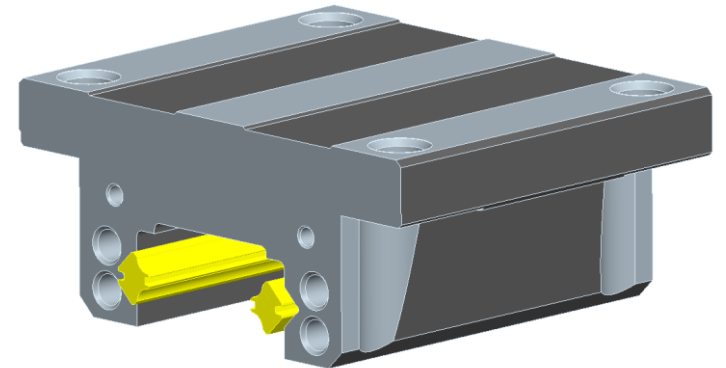


BSHP size 25



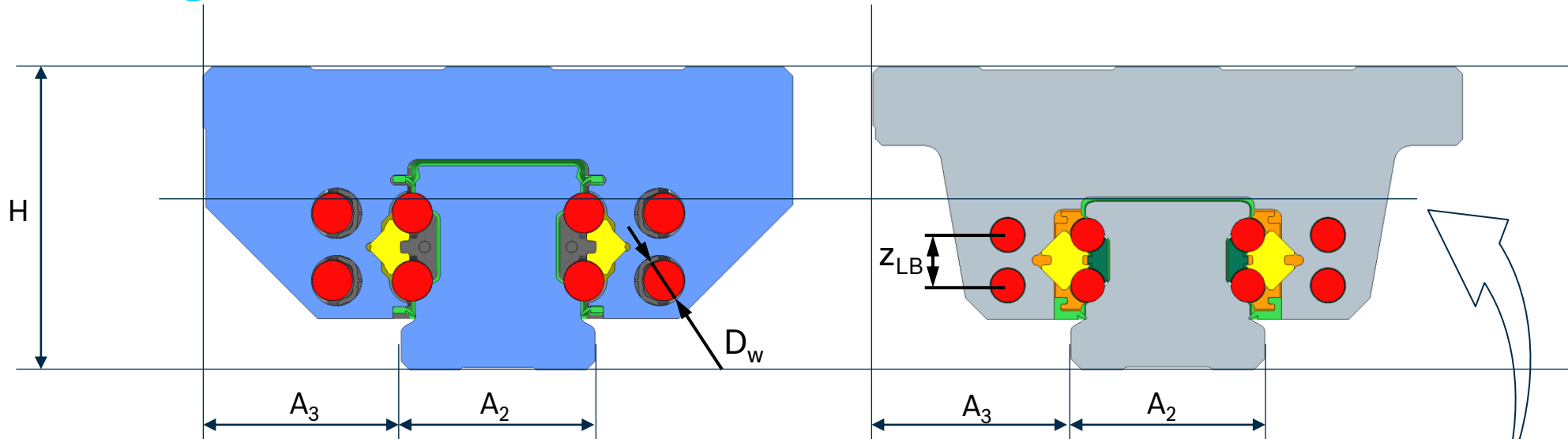
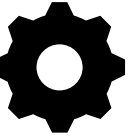
BSCL size 25

- Bigger steel insert cross section (overlapping steel insert)
- Steel insert with **HP-Technology**



Technical details

Mounting Dimensions- are the same!



BSHP: size 25
 $D_w = 4,762 \text{ mm}$
 $z_{LB} = 8 \text{ mm}$

BSCL: size 25
 $D_w = 3,969 \text{ mm}$
 $z_{LB} = 6 \text{ mm}$

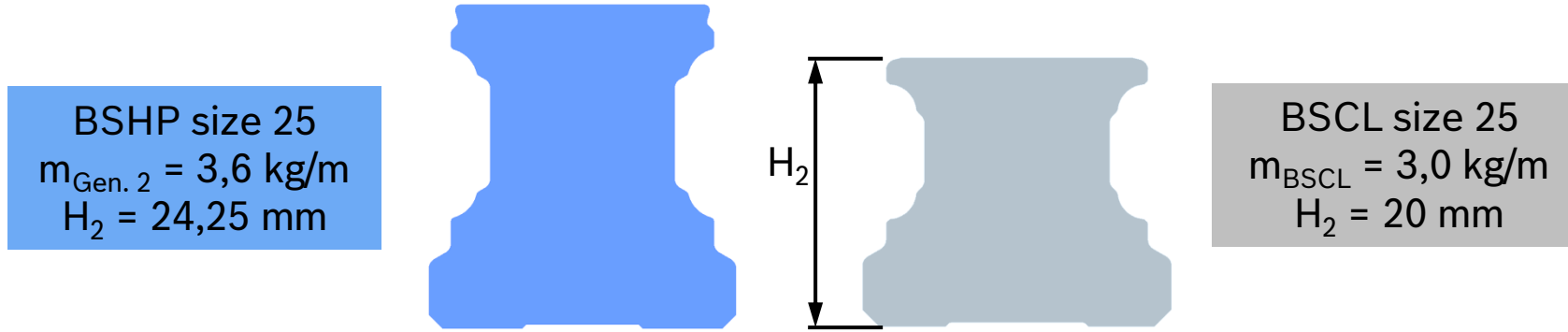
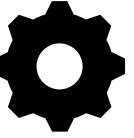
BSHP H = BSCL H although height of rails are different

BSHP A_3 = BSCL A_3

BSHP A_2 = BSCL A_2

Technical details

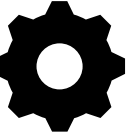
Guide Rail- Different Total Heights



- Lower Guide Rail → Material Savings
- No Cover strip available
 - simplified grinding process
 - Reduction of variants

Technical details

Sealing tests



Tests have been performed internally in test chamber with standard seal:

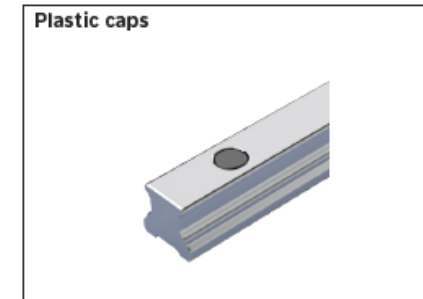
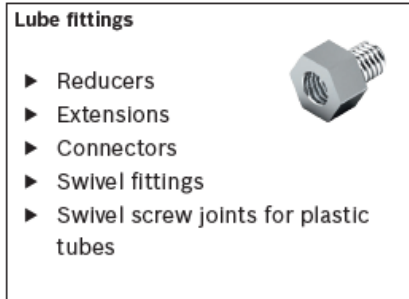
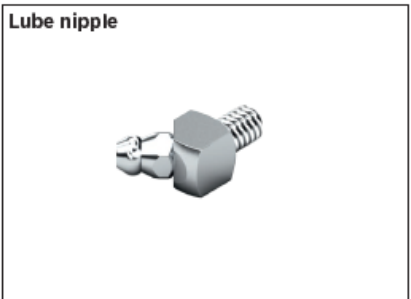
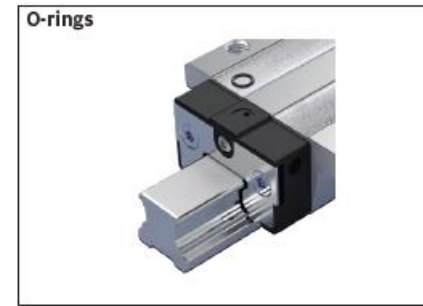
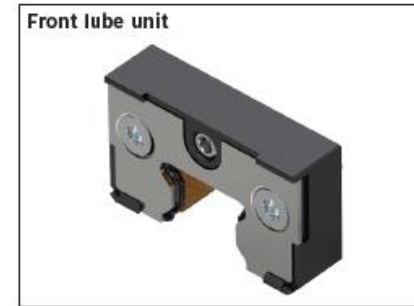
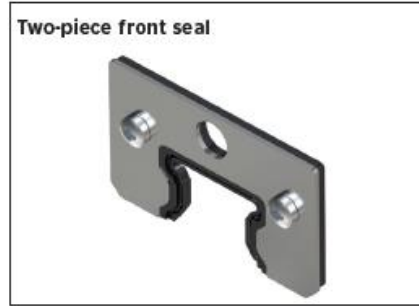
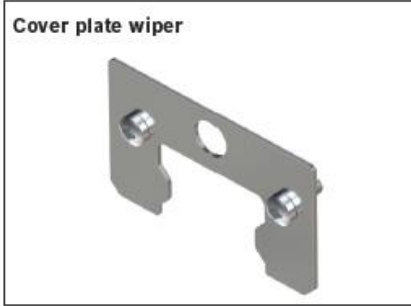
- Wood dust test (with more than 1,100 km) → successful ✓
- Chip test (brass, aluminum, cast iron and steel): Stop after 900 km → successful ✓
- Cooling lubricant → successful ✓





Accessories

Accessories Overview



Accessories

Scraper plate



- Similar shape as current BSHP version
- Same screw length as for the additional front seal
- Gap between rail and cover plate wiper as for current BSHP versior



Accessories

Additional front seal



- One-piece design or two-piece design if the scraper plate is integrated
- Comparable wiping effect to current BSHP version
- Only one screw length if the scraper plate is also mounted
- No spacer needed if additional seal is mounted

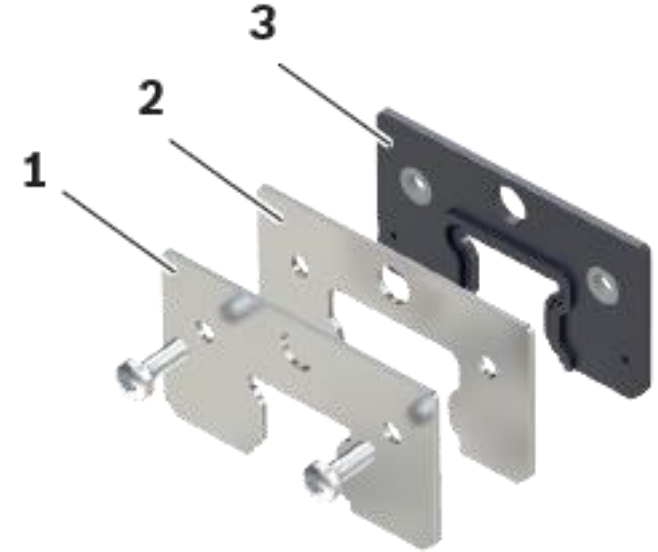


Accessories

Seal kit



- Seal kit as an alternative product when combining the scraper plate with front seal
- Without spacer



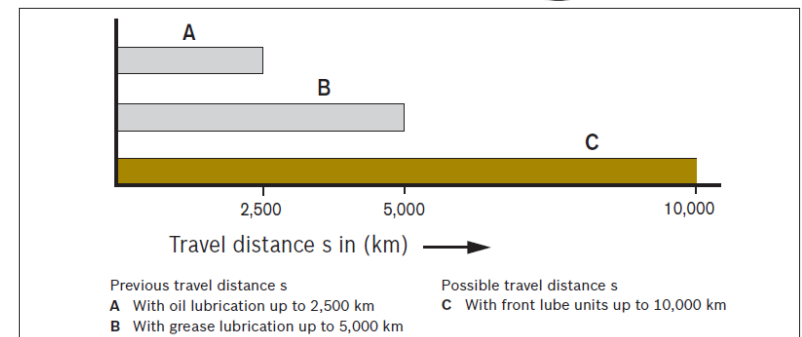
- 1 Scraper plate
- 2 Reinforcing plate
- 3 Two-piece front seal

Accessories

Front lube units



- For extended travel distances without relubrication
- One-piece design and functionality like the current BSHP version
- The unit can be relubricated through the side lubrication port
- Regreasing interval 10.000 km for size 20-45
- Frictional forces no higher than with BSHP + front lube unit

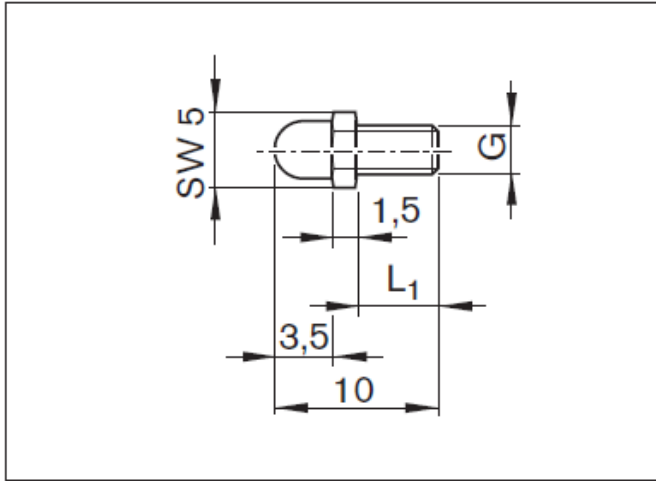


Accessories

Lube nipple, lube fittings size (15)-20: M4

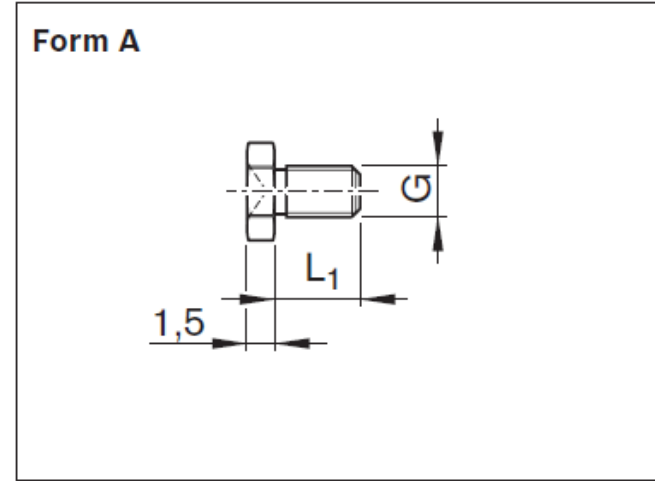


Ball-type lube nipple

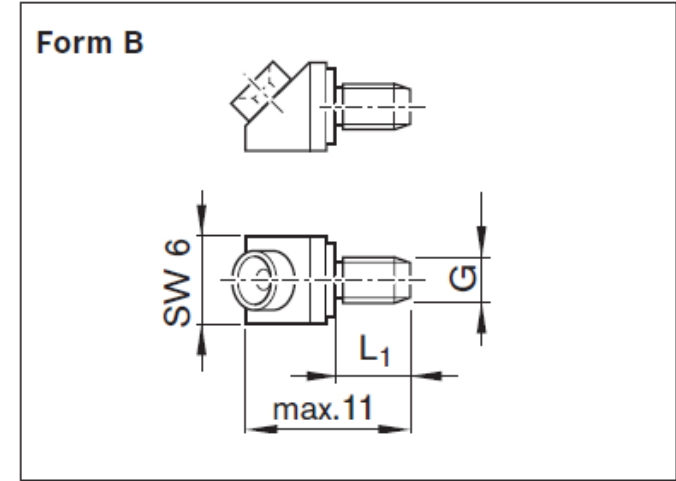


Material number	Dimensions (mm)		Mass (g)
	G	L ₁	
R3417 006 01	M4	5	0.5

Funnel-type lube nipple according to DIN 3405



Material number	Dimensions (mm)		Mass (g)
	G	L ₁	
R3417 069 09	M4	5	0.3



Material number	Dimensions (mm)		Mass (g)
	G	L ₁	
R3417 070 09	M4	5	1.5

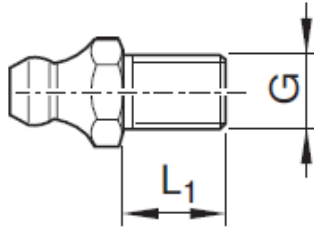
Accessories

Lube nipple, lube fittings size 25-45: M6



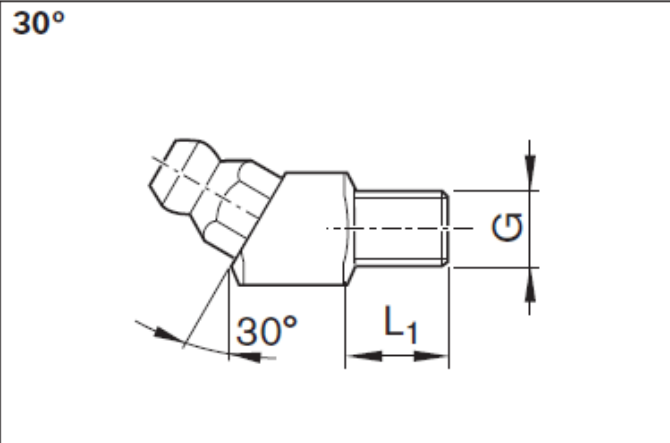
Hydraulic-type lube nipple according to DIN 71412

Form A

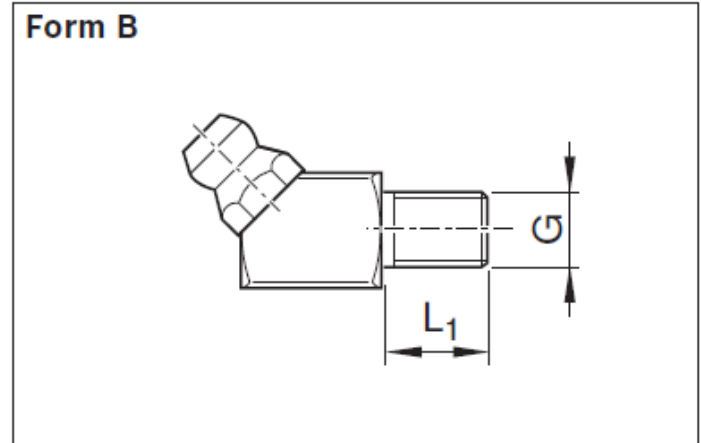


Material number	Dimensions (mm)		Mass (g)
	G	L ₁	
R3417 008 02	M6	8	2.6
R3417 016 02 ¹⁾			

Hydraulic-type lube nipple according to DIN 71412



Material number	Dimensions (mm)		Mass (g)
	G	L ₁	
R3417 023 02	M6	8	7.4



Material number	Dimensions (mm)		Mass (g)
	G	L ₁	
R3417 007 02	M6	8	7.4

1) Lube nipple Resist NR II made of corrosion-resistant steel according to DIN EN 10088

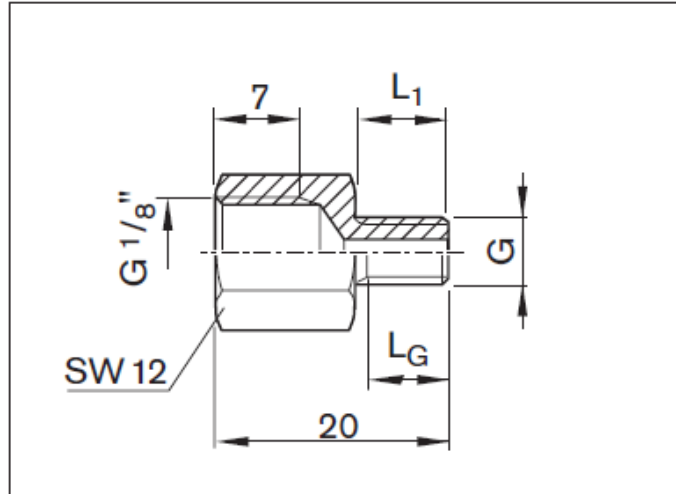
Accessories

Lube nipple, lube fittings size 25-45: M6



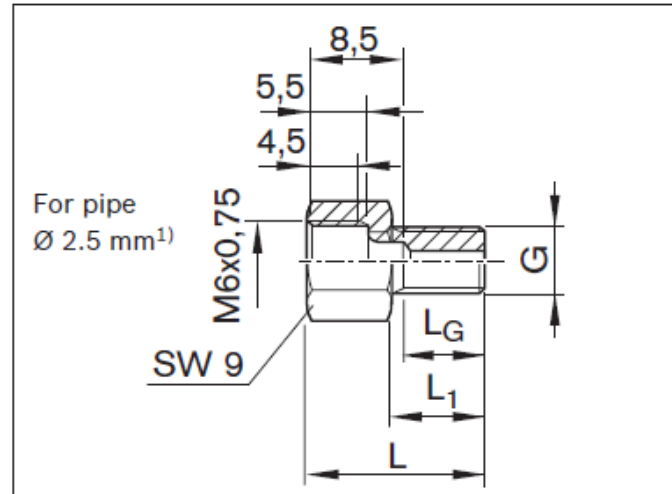
Lube fittings

Reducers

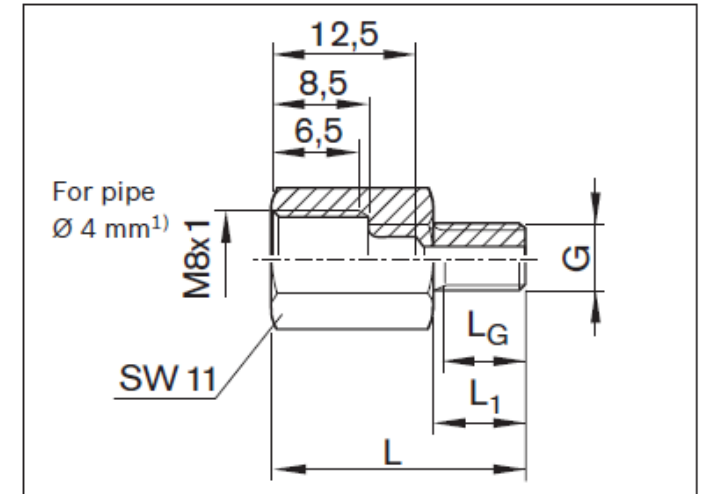


Material number	Dimensions (mm)			Mass (g)
	G	L ₁	L _G	
R3455 030 34	M6	8	6.5	7.5

Connectors



Material number	Dimensions (mm)				Mass (g)
	G	L	L ₁	L _G	
R3455 030 38	M6	15.5	8	6.5	4.1



Material number	Dimensions (mm)				Mass (g)
	G	L	L ₁	L _G	
R3455 030 37	M6	22	8	6.5	8.8

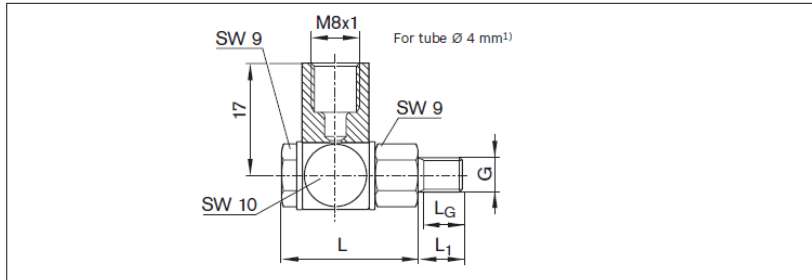
1) For connections according to DIN 2353 (solderless tube fittings)

Accessories

Swivel fittings, straight connectors size 25-45: M6

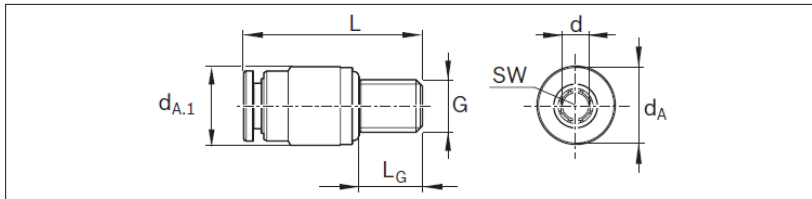


Swivel fittings



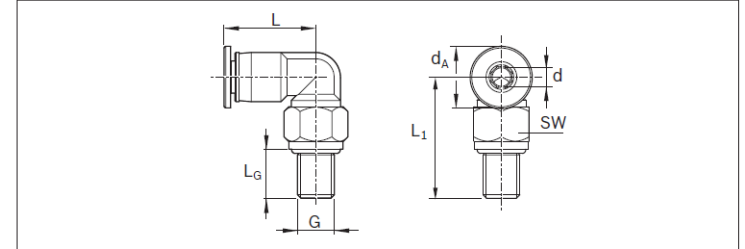
Material number	Dimensions (mm)				Mass (g)
	G	L	L ₁	L _G	
R3417 018 09	M6	21.5	8	6.5	18.6

Straight connectors²⁾ for plastic tubes and metal pipes



Material number	Dimensions (mm)				Mass (g)			
	d _A	d _{A.1}	d±0.1	G				
R3417 071 09	6.5	6.5	3	M4	16.2	5	1.5 ³⁾	1.4
R3417 075 09	9.0	9	4	M6	24.5	8	2.5	4.6
R3417 076 09	11.0	11	6	M6	26	8	2.5	6.2

Elbow plug-in connections rotatable²⁾ for plastic tubes and metal pipes

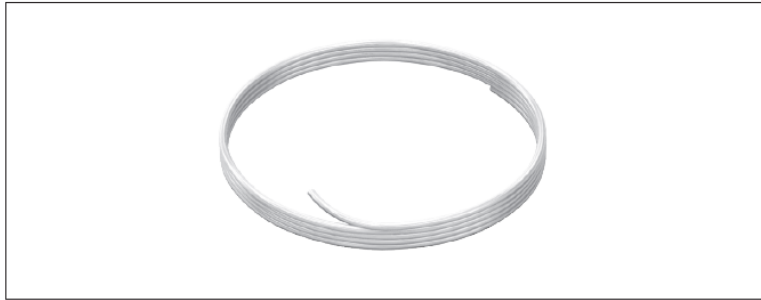


Material number	Dimensions (mm)				Mass (g)			
	d _A	d±0.1	G	L				
R3417 072 09	6.5	3	M4	18.0	19	5	6 ³⁾	1.7
R3417 078 09	9.0	4	M6	18.1	18.1	8	9	10.8
R3417 079 09	11.0	6	M6	20.8	18.1	8	9	12.9

- 1) For connections according to DIN 2353 (solderless tube fittings)
- 2) Max. lubrication pressure: 30 bar (exerting slow pressure with manual grease gun)
- 3) Max. tightening torque M_A = 0.5 Nm

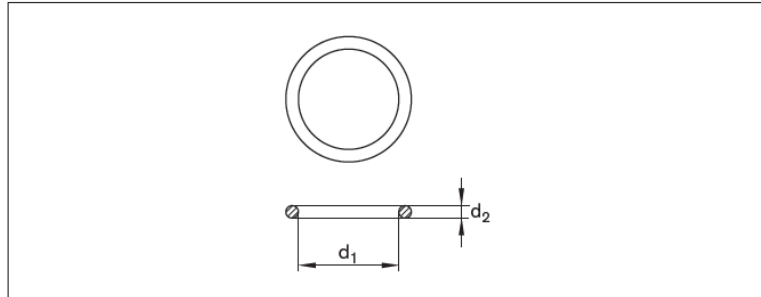
Accessories

Lube fittings size 25-45: M6



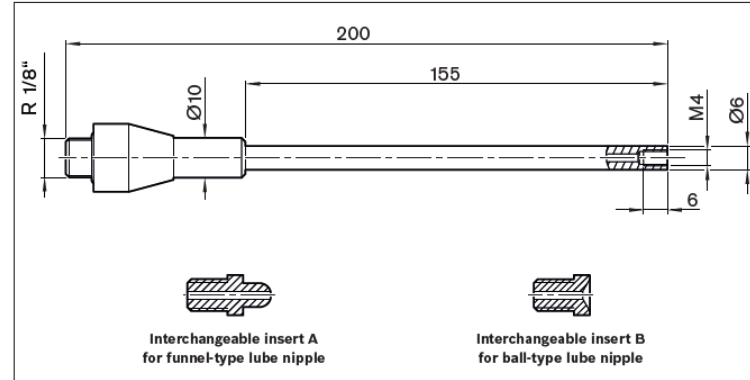
Plastic tube Ø 3 mm
for lube fittings

Material number	Dimensions			Mass (kg)
	External Ø (mm)	Internal Ø (mm)	Length (m)	
R3499 287 00	3	1.7	50	0.4



O-rings

Material number	d ₁ x d ₂ (mm)
R3411 130 01	4 x 1.0
R3411 131 01	5 x 1.0
R3411 003 01	6 x 1.5



Nozzle pipe

For manual grease guns.
For the lubrication of funnel-type and ball-type lube nipples for size 20 BSCL ball runner blocks.

Scope of delivery:

- 1 x nozzle pipe
- 1 x interchangeable insert A for funnel-type lube nipple
- 1 x interchangeable insert B for ball-type lube nipple

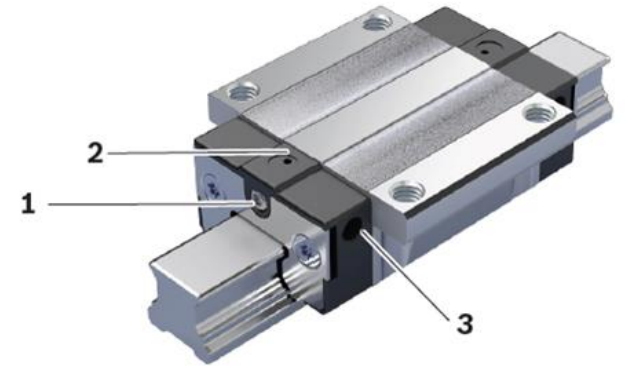
Material number	Mass (g)
R345503106	158

Accessories

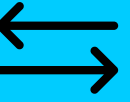
Lubrication



- BSCL ball runner blocks have 4 different positions for relubrication on every end cap
- The integrated channels distribute the lubrication
- Relubrication intervals up to 5.000 km
- Lube nipple (not included in the package):
 - Size 20: Ball type lube nipple M4
 - Size 25-45: Hydraulic-type lube nipple M6
- BSCL ball runner blocks can be lubricated with grease and oil



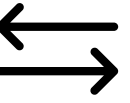
1. Front lube connection
2. Top lube connection
3. Side lube connection (2x per end cap)



Comparison BSHP - BSCL

BSCL: Ball Rail System Compact Line

BSCL/ BSHP Conversion Table



BSCL	R205A...20	R205C...20	R205E...20
BSHP	R1651...20	R1622...20	R1621...20

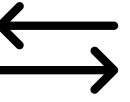
BSCL	R2055...31
BSHP	R1605...31



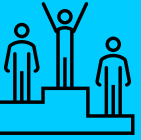
BSCL	R205B...20	R205D...20	R205F...20
BSHP	R1653...20	R1623...20	R1624...20

Comparison BSHP-BSCL

Differences between BSCL and BSHP

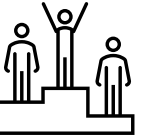


	BSCL	BSHP
Size	20 - 45	15 - 65
Load capacity $C_{100\text{dyn}}$	Up to 79.200 N	Up to 223.000 N
Max. speed	5 m/s	10 m/s
Max. length	4.000 mm	6.000 mm
Accuracy classes	N, H and P	N, H, P, XP, SP and UP
Preload classes	C0, C1 and C2	C0, C1, C2 and C3
Corrosion resistance	Not available	available
Types	6 Designs available	12 Designs available
Rail types	1 Design available	6 available
Relubrication intervals	Up to 5.000 km	Up to 20.000 km
Seals (integrated)	✓	✓
Cover strip	x	✓
Stiffness	++	+++
Ball chain	x	✓
Lubrication nipples (integrated)	x	✓

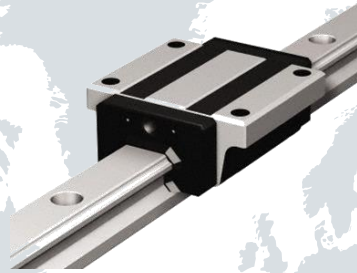


Competitor comparison

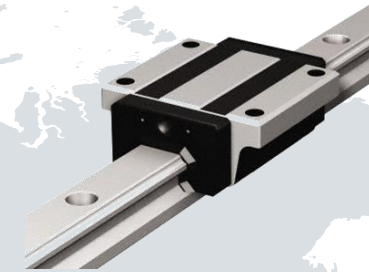
Competitors



BR BSCL -
series



THK HSR-C/R class Ct



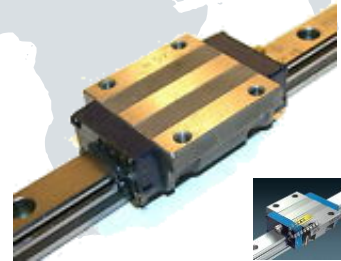
THK HSR-A/B/C/R...-
LA/LR... - CA/HA...



HIWIN HG - series



PMI Compact Type,
MSB series



IKO ME series



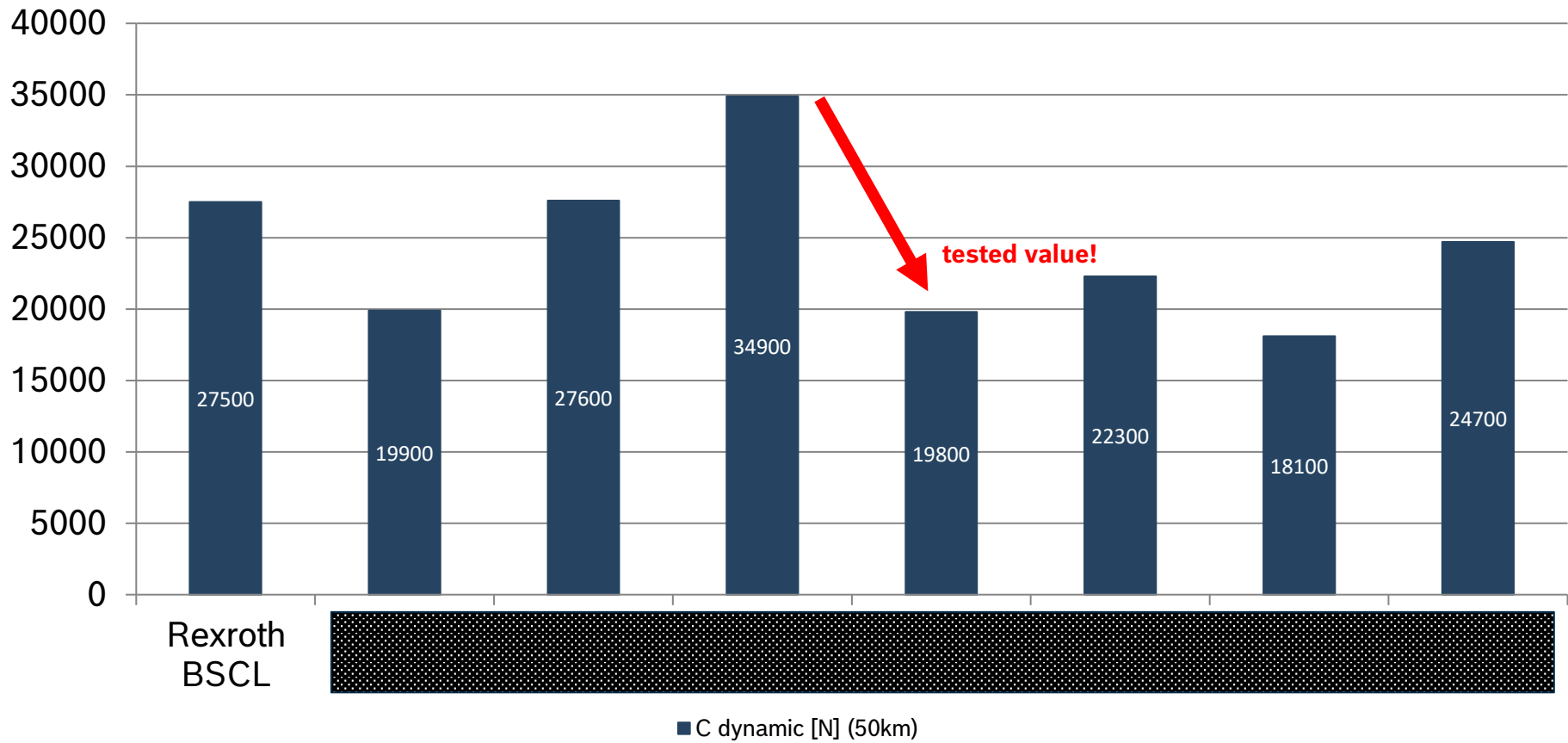
NB SGL
HT./HY.- series

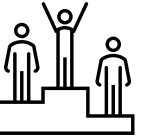
Competitor comparison

C_{dynamic}



C dynamic [N] (50km) – catalogue values





Differentiation

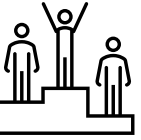
- Unlimited interchangeability within BSCL line
- Dimensions according ISO12090-1
- RoHs conform
- Very good running performance by means of HP-effect
- Maximum rail length 4000 mm
- All side lubrication ports
- Easy customizing

Technical Key data

- Types: FNS / FLS / SNS / SLS / SNH / SLH
- Sizes: 20-45
- Accuracy classes: N / H / P
- Preload classes: C0, C1, C2
- Load Capacities Cdyn: 14.600 N to 79.200 N
- Max Speed: up to 5 m/s
- Max. acceleration: 500 m/s²
- Lubrication: Oil and grease lubrication
- Temperature: 0 °C - 80 °C; short time up to 100 °C
- Rail length: till 3.880 mm one piece

Fact sheets

PMI Compact Type, MSB Series



Features

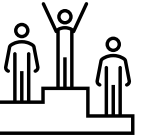
- Good product portfolio (FNS, FLS, SNS, SLS, SNH, SLH)
- Sizes 15-35
- 3 preload classes FC, F0, F1 (light, middle, high)
- X-arrangement of raceways; 4 rows 2 x 45°
- Low friction, add. front seal, scraper plate
- Accuracy classes UP, SP, P, H, N
- Interchangeability for P, H, N; no interchangeability UP, SP
- Accuracy classes slightly better
- Rail can be mounted from “above“ and “below“ (1605/1607)
- Coverstrip, steel-/copper plugs available
- Max. rail length in one piece 4000 mm

Weak points

- Low load capacities
- Poor one piece rail length $L_{max} = 3000$ mm
- X-arrangement of raceways leads to lower torsion moments and less rigidity

Fact sheets

THK HSR-C/R Class Ct



Features

- Poor product portfolio (FNS, SNH)
- Sizes 15-35
- X-arrangement of raceways: 4 rows 2 x 45°
- Interchangeability
- Accuracy classes not comparable Ct7 below N, Ct5 between N and H
- Rail can be mounted from above, plastic plugs

Weak points

- Low dynamic load capacities
- Poor one piece rail length $L_{max} = 3000$ mm
- X-arrangements of raceways leads to lower torsion moments and less rigidity
- Only 2 accuracy classes
- Only 1 kind of sealing, no accessories

Questions and feedback are welcome!