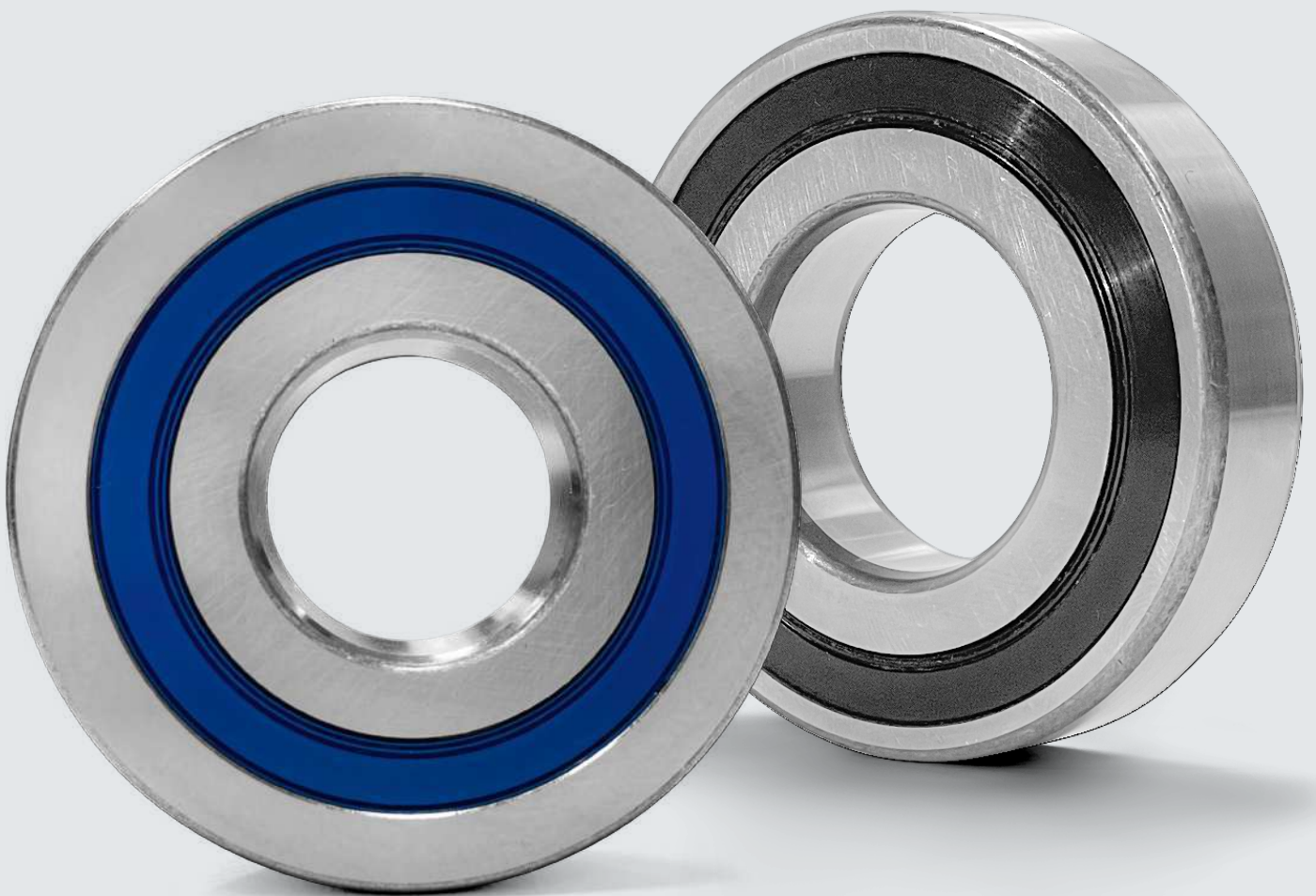


SKF angular contact thrust ball bearings for screw drives

New generation of low-friction products



SKF angular contact thrust ball bearings for screw drives

Machine tools require screw drives that can position a work piece or machine component efficiently and precisely. To meet these requirements, screw drives can be supported at both ends by SKF super-precision angular contact thrust ball bearings to provide a high degree of stiffness and carry loads.

The angular contact thrust ball bearings for screw drives have a 62° contact angle and a great wall thickness of inner ring and outer ring. This design has the following features:

- High axial stiffness
- High load carrying capacity
- P4 dimensional accuracy
- P2 running accuracy
- Small friction torque

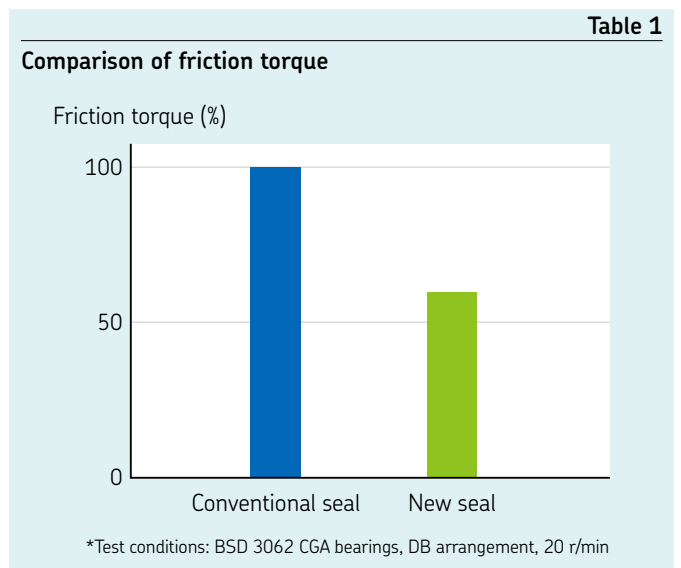
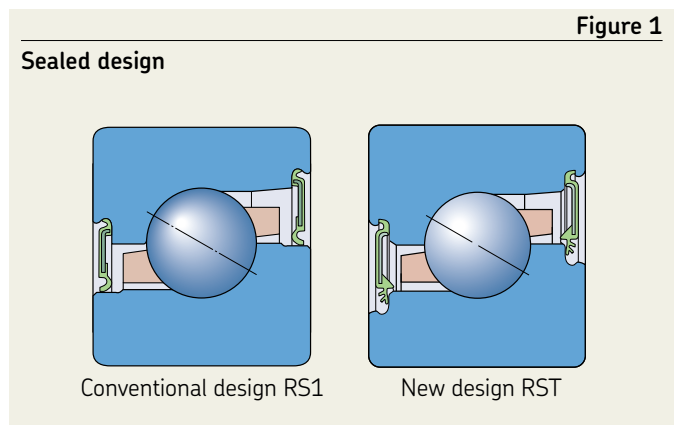


Sealed design

The bearings to support screw drives are initially equipped with contact seals. The seals are made of NBR and are reinforced with sheet steel. Their permissible operating temperature is -40 °C to +100 °C. Temperatures up to 120 °C can be tolerated for short periods.

The new sealed design has the following advantages over the conventional design:

- 40% less friction torque and reduced energy consumption
- Improved protection against cutting fluid and chips, and extended service life
- Seals of different colours at the two ends for ease of installation: blue seal at the large end (marked with a "<" symbol) and black seal at the small end



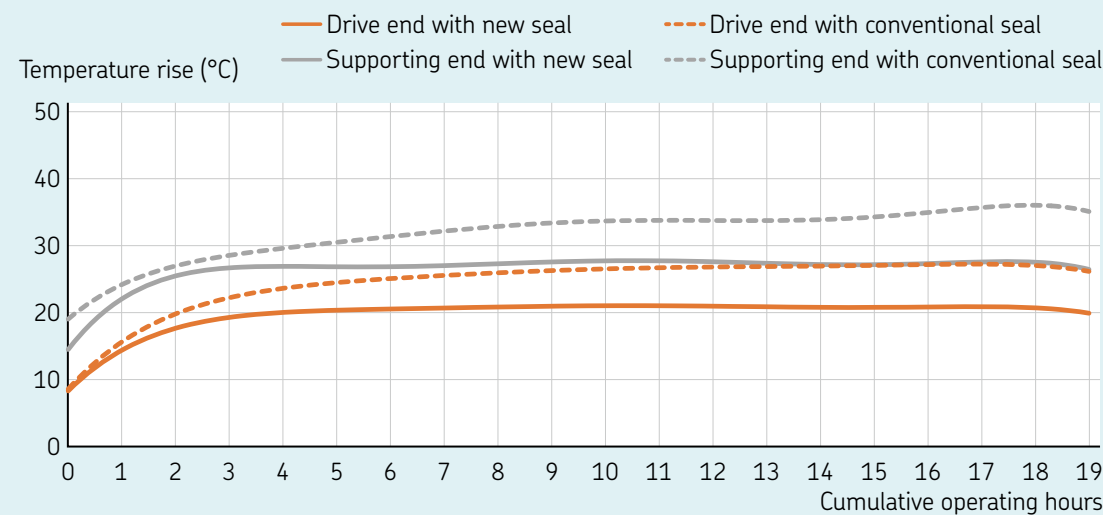
Initial grease

Screw drives are initially filled with high performance grease that resists corrosion and ageing. Its permissible operating temperature is -35 °C to +140 °C. The grease has:

- Higher load carrying capacity and longer service life
- Better oxidation resistance
- No impact on friction torque

Table 2

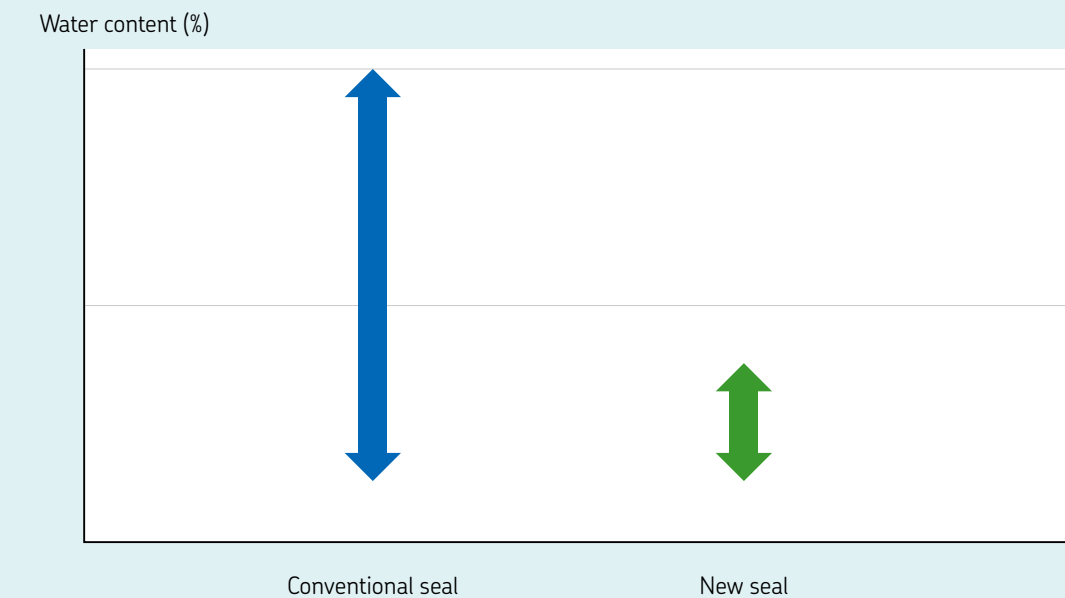
Temperature rise of the new generation bearings running at limiting speeds for long period



* Test conditions: machining centre; BSD 3062 CGA bearings, TBT arrangement at drive end, DF arrangement at support ending; 3000 r/min

Table 3

Water resistance of new seal



* Water resistance test: BSD 3062 CGA bearing, DB arrangement, 1000 r/min, test duration of 168 hours

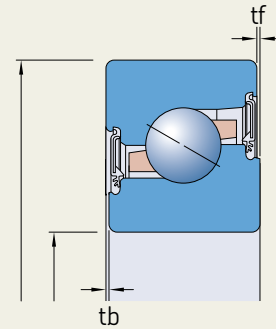
Universally matchable

The angular contact thrust ball bearings are universally matchable and can be matched freely. The bearings do not need to be adjusted additionally to obtain an appropriate preload.

The tolerance zone, i.e. variation, of t_f and $t_b^{1)}$, is $1.5\text{ }\mu\text{m}$.

¹⁾ t_f and t_b are measurements under certain preload.

Figure 2
Universally matchable preload



Bearing sets

The outside diameter of the bearing is marked with a "<" symbol, indicating that the bearing can bear an axial force to the right. When mounting bearings, confirm how the bearings should be mounted in relation to the direction of force to avoid misoperation. Universally matchable bearings can be mounted in sets with any bearing arrangement. See **Figure 3** to **Figure 5**.

Figure 3

Bearing set with two bearings

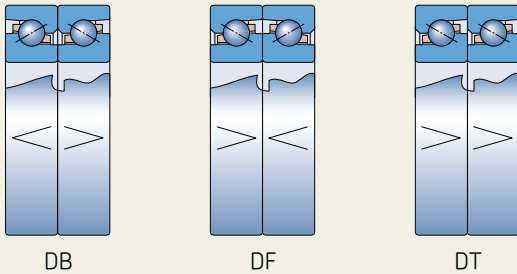


Figure 4

Bearing set with three bearings

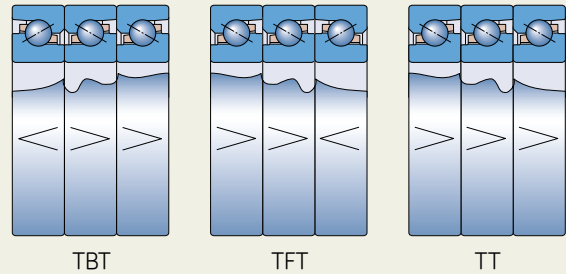
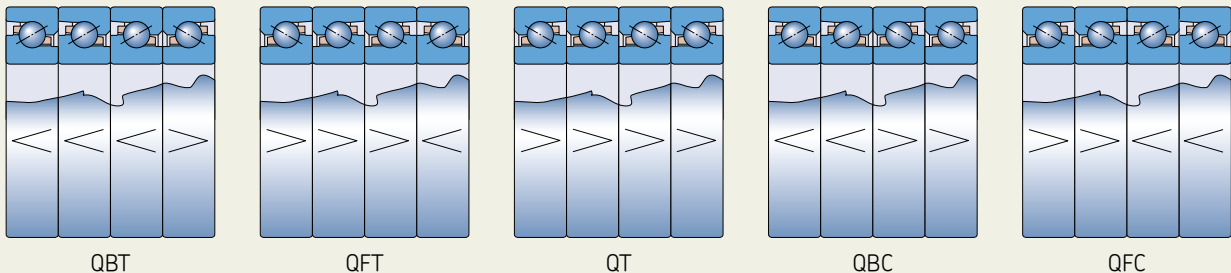


Figure 5

Bearing set with four bearings



Attainable speeds

The attainable speeds of different bearing sets under different preload conditions can be obtained by multiplying the limiting speeds by a reduction factor .

Note: For the limiting speeds, see **Table 9** on **page 7**.

Table 4

Speed reduction factors for bearing set

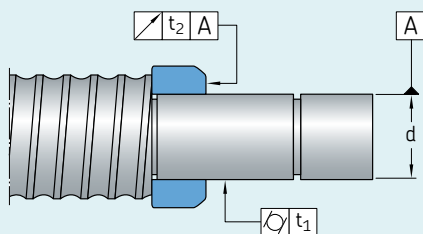
Preload class	bearing set with two bearings DB/DF	bearing set with three bearings TBT/TFT	bearing set with four bearings QBC/QFC
A	0.8	0.65	0.5
B	0.4	0.3	0.25

Adjacent structures

Adjacent screw drive structures should be manufactured accurately so that the required high running accuracy can be achieved after the bearings to support screw drives are mounted. Therefore, the deviations of dimensional and form accuracy of all adjacent structures shall be minimized. The recommended tolerances for screw drive shaft system and screw drive housing are listed in Table 5 and Table 6, respectively.

Table 5

Tolerance of screw drive shaft system

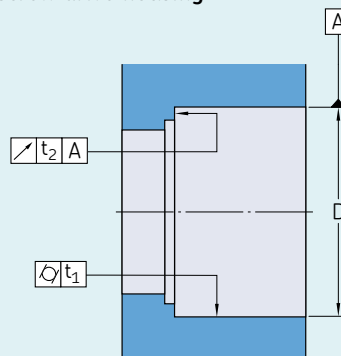


Accuracy of screw drive

d	incl.	(h4)		Cylindricity	Runout
up		High	Low	(IT2)	(IT2)
mm		µm		t ₁	t ₂
10	18	0	-5	2	2
18	30	0	-6	2.5	2.5
30	50	0	-7	2.5	2.5
50	80	0	-8	3	3

Table 6

Tolerance of screw drive housing



Accuracy of screw drive housing

D	incl.	(H5)		Cylindricity	Runout
up		High	Low	(IT2)	(IT2)
mm		µm		t ₁	t ₂
-	50	+11	0	2.5	4
50	80	+13	0	3	5
80	120	+15	0	4	6
120	150	+18	0	5	8

Typical bearing arrangements

1. One end retained and one end free. Suitable for applications with a short stroke of screw drive and no special requirement on the stiffness.

Retained — free

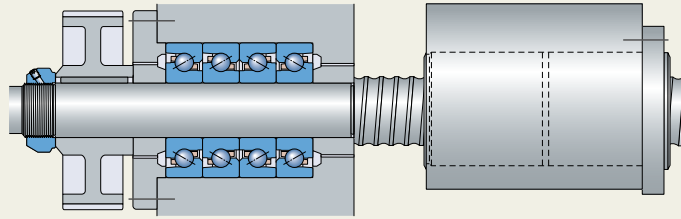


Figure 6

2. Drive end retained and supporting end semi-retained. This arrangement results in a relatively high stiffness. But when the bearing is tensioned, make sure that it is evenly stressed.

Semi-retained — retained

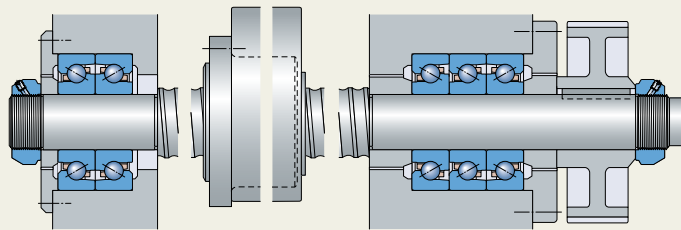


Figure 7

3. Both ends retained. This arrangement results in a high stiffness and facilitates tensioning of screw drives and assembly of bearings.

Retained — retained

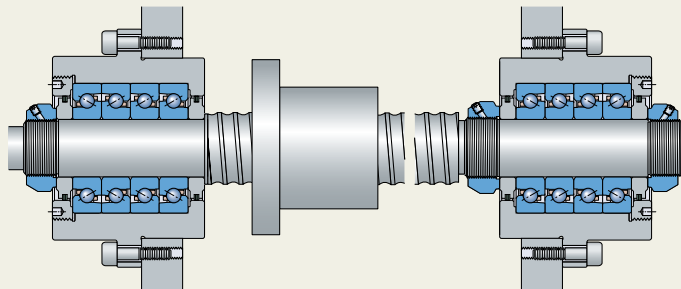


Figure 8

Markings on bearings

Each angular contact thrust ball bearing has various markings on the outside surface. See **Figure 9**.

- 1. SKF trademark
- 2. Bearing designation
- 3. "MATCHABLE" label
- 4. Country of manufacture
- 5. QR code
- 6. Production date
- 7. Mean outside and the mean bore diameter deviations from the nominal diameters

A "V-shaped" marking on the outside surface of the outer rings of single universally matchable bearing indicates the bearing assembly direction. See **Figure 10**.

Package of bearing

See **Figure 11** for the outer package of SKF angular contact thrust ball bearings for screw drives. The bearing markings and QR code are printed on the outer package.

Bearing designation

The bearing designations are printed on the bearing side face. The designation system of angular contact thrust ball bearings for screw drives is described in the **Table 7** below.

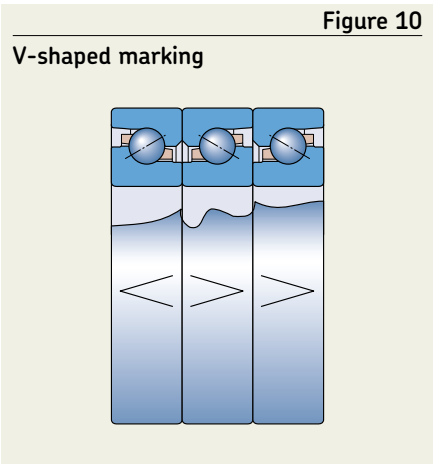
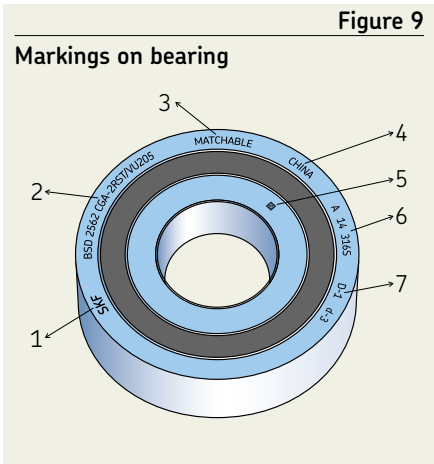


Table 7

Bearing designation system

	BSD	2562	CG	A	- 2RST	/VU205
Bearing series	BSD	Single direction bearing				
Dimensions	2562	25 mm bore diameter, 62 mm outside diameter				
Design	C	Optimized internal design				
	G	Universally matchable				
Preload	A	Light preload				
Sealed	2RST	Low-friction seal, NBR, on both sides				
Suffix	/VU205	Made in China				

Product table for single row bearing

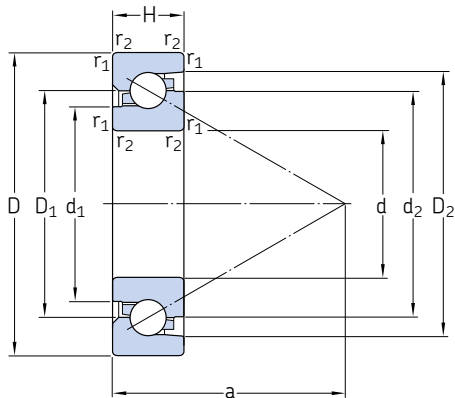


Table 8

Bearing designation system

Designation	d	d ₁	d ₂	D	D ₁	D ₂	H	r _{1,2} min	Preload A	B	Grease fill
	mm								N	N	cm ³
BSD 2047 C	20	29.4	34.5	47	34.6	40.7	15	1	1480	2960	1.4
BSD 2562 C	25	39.9	46	62	46.1	53	15	1	2150	4300	2
BSD 3062 C	30	39.9	46	62	46.1	53	15	1	2150	4300	2
BSD 3572 C	35	48.6	55	72	55.1	62.7	15	1.1	2950	5900	2.5
BSD 4072 C	40	48.6	55	72	55.1	62.7	15	1.1	2950	5900	2.5

Table 9

Bearing designation system

Designation	Axial stiffness, preload		Tightening torque M _A	Weight	Load rating kN		Limiting speeds	
	A	B			Ca	COa	Oil-air	Grease
	N/μm	N/μm	Nm	kg	kN	kN	r/min	r/min
BSD 2047 C	680	860	17.3	0.13	22	49	12000	9500
BSD 2562 C	870	1110	33.6	0.24	28.5	71	9500	8000
BSD 3062 C	870	1110	33.6	0.22	28.5	71	9500	8000
BSD 3572 C	1080	1370	43	0.3	36.5	98	9000	7500
BSD 4072 C	1080	1370	43	0.26	36.5	98	9000	7500

Tightening torques under different bearing arrangements

The required tightening torque of a bearing set $M_{Aset} = M_A \times K$

M_A see **Table 9**.

Table 10

Tightening torque correction factor					Preload A	Preload B
Tightening torque correction factor for different bearing arrangements					K	K
K						
DB	< >	DF	> <	← →	1.0	1.0
TBT	<< >	TFT	> <<	→	1.5	1.36
				←	1.0	1.0
QBT	<<< >	QFT	> <<<	→	2.12	1.89
				←	1.0	1.0
QBC	<< >>	QFC	>> <<	← →	1.58	1.25
PBT	<<<< >	PFT	> <<<<	→	2.31	2.15
				←	1.0	1.0
PBC	<<< >>	PFC	>> <<<	→	2.0	1.74
				←	1.5	1.23
HBC	<<< >>>	HFC	>>> <<<	← →	2.2	1.6



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