

**Bräcker**

# Short Staple Manual

Products, Technology &  
Application





**Bräcker**



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## Introduction

### Company

Founded in 1835 as a family business, Bräcker AG soon developed into a specialist for key products in the textile industry. With the expansion to France in 1951, the foundation stone was laid for successful international development.

Thanks to a strong commitment to opening up new markets early on, in particular overseas, Bräcker was able to become a global market leader. This is a demanding, responsible position that regularly proves the innovative strength and market flair of Bräcker, but one that is not without its challenges. Bräcker's expertise and market knowledge provides a strong foundation that supports and solidifies its exceptional position in the market.

### Enjoyable Performance

Uncompromising quality standards and extensive industry knowledge make Bräcker the market leader in the manufacture and marketing of key components for ring spinning machines. This is evident not only in the wide range of excellent products but also in the demonstrative competence of the staff when offering advice and providing solutions.

Thanks to leading-edge technology and innovative component manufacturing practices, as a quality-certified company our products guarantee maximum production capacity and maximum operational reliability. Through constant monitoring, we ensure optimal and consistent quality in our production processes.

We continuously build upon and perfect the knowledge of technology and components that we have gathered over decades in the industry. Our staff have many years of industry knowledge, giving you as a customer the certainty that our products will always meet your exact requirements.

As a Bräcker customer you can benefit from fast and direct access to a global sales, consultancy and service network – as well as a skilled contact partner. The representatives are well-versed in your country's culture and they are in constant contact with the main office. This allows the knowledge gained in practice to be continuously translated into innovating products and services.

In a nutshell, the Bräcker brand means more profit and increased success for your company!

## Benefiting Our Customers

Swiss technology, expertise and service is transformed into profit for our customers. Our legendary Bräcker manual shows you how you can benefit from Bräcker products, technology, knowledge and service.

The manual contains information on:

### Bräcker products and technology

- Leading-edge technology for key components in spinning mills
- Development and manufacture of specific, high-performance, innovative products

### Bräcker expertise

- Our distinctive knowledge of technology and components, developed and perfected over decades
- Expertise in consulting and solution-finding, thanks to extensive market knowledge and a wealth of experience

### Bräcker service

- Our wide range of top-quality products for any application
- The right solution for every yarn quality, with key components that are optimally matched to one another

The result is a consistent increase in quality and productivity for you as a Bräcker customer.

We are looking forward to being a partner for your business.

**Bräcker – Enjoy Performance!**



**Bräcker Products**  
Swiss Premium Quality



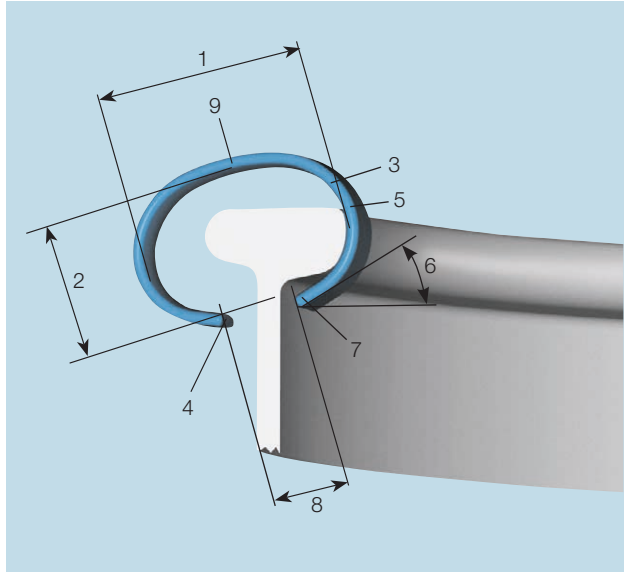
# Ring Travelers

The Bräcker steel ring traveler is one of the key components in ring spinning and twisting of coarse and fine yarn counts as well as compact and other special yarns. The numerous advantages of Swiss-made Bräcker ring travelers are thanks to many years of experience in developing and manufacturing ring travelers within the narrowest tolerances.

## Designation of the Ring Traveler Parts

### C-Shaped Ring Travelers

- 1 Inner ring traveler width
- 2 Height of bow
- 3 Yarn passage
- 4 Wire cross section
- 5 Traveler-ring contact surface
- 6 Angle of toe
- 7 Toe
- 8 Opening
- 9 Upper part of traveler bow



## Finishes and Treatments

**Travelers with an additional finish have the following advantages:**

- Higher ring traveler speeds
- Longer ring traveler service life
- Improved running behavior, resulting in a more consistent yarn quality
- Rust/oxidation protection (especially STARLET and STARLET*plus*)

### SAPHIR

The SAPHIR ring traveler has been specially developed for high-performance applications. The components offer enhanced performance along the entire ring traveler cross section and offer the same advantage even when the surface is worn.



### ONYX

The groundbreaking surface treatment of the ONYX ring travelers offers greater efficiency in spinning mills. The improved gliding characteristics allow the spindle speed to be increased by up to 1 000 rpm as well as extending the service life of the ring traveler by up to 50 %.



### STARLET

A nickel coating is applied with a special process. Low friction values in the yarn passage prevent damage to fibers and offer optimum resistance to corrosion.



### STARLET*plus*

The STARLET*plus* ring traveler considerably reduces the risk of early groove formation and guarantees a longer ring traveler service life. It is an upgrade of the popular STARLET coating and offers optimal resistance against corrosion.





### **CARBO**

The Bräcker range is complemented by the CARBO ring traveler, a product specially designed to meet the requirements of man-made fiber (MMF) spinning mills.

### **PYRIT**

PYRIT ring travelers have an enhanced steel structure thanks to additional components. This considerably improves the wear resistance. This improves the running behavior and guarantees a more consistent yarn quality. Even in high-speed applications, the traveler service life can be increased by more than 100 % compared to travelers with a standard finish.

### **ZIRKON**

The high-tech coating with outstanding properties for optimal performance and a long service life. Specially designed for compact spinning at the highest speeds, with a ring traveler service life of 1 000 hours or more.

**ZIRKON ring travelers are intended for use only on TITAN rings.**

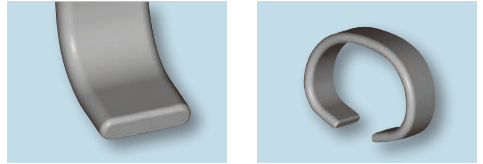


## Wire Cross Sections

The wire cross section influences the yarn quality, the running behavior, performance and service life of the ring travelers. Selecting the right wire cross section is an important factor for ensuring optimal results.

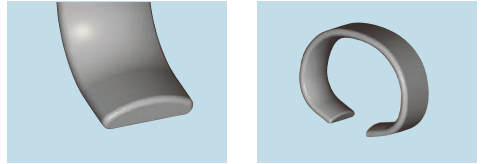
### f – Flat

For cotton, viscose and blends.  
Helps to reduce hairiness.  
For average spindle speeds.



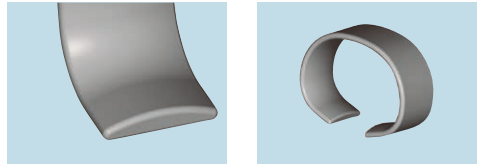
### dr – Half round

Prevents fiber damage on synthetics and blends.  
Reduces neps on fine cotton yarns.  
Commonly used with core and slub yarns.



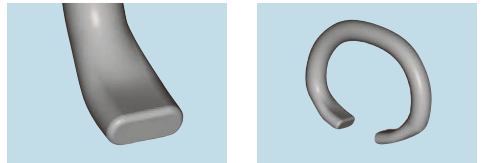
### udr – Ultra half round

For cotton and blends: An enlarged contact surface on the ring raceway enable a high level of performance. **Most commonly used wire cross section.**



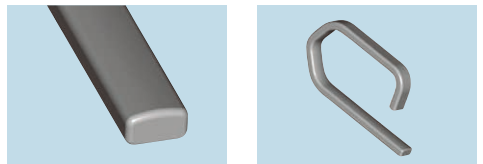
### fr – Flat/round

For core yarns with polyester core, acrylics and delicate fibers.  
f profile at the toe improves the ring contact.  
r-profile offers fiber protection in the yarn passage.



### drh – Half round high

Special profile for SU ring travelers.  
Suitable for viscose and polyester.



## Choosing the Right Traveler

The choice of traveler shape is extremely important, which means it must be precisely coordinated to the ring shape and the yarn. Specialist knowledge and a commitment to ensuring optimal performance mean new ring and traveler shapes are constantly being introduced to the market. This means choosing the right products is not an easy task. As a ring and ring traveler supplier, Bräcker is able to recommend the best ring traveler combinations. For example, smooth operation is best achieved by a C-shaped traveler due to the very low center of gravity. The traveler arch, however, must be high enough such that no thread can be caught between the ring and traveler. Soft-twisted or carded yarns have a larger volume than hard-twisted, combed yarns with the same yarn count. They need a ring traveler with a slightly greater arch height or larger yarn passage space.

In addition to the shape, the choice of wire profile, material and surface finish is particularly important for high-performance ring travelers. If the wrong choice is made, this will result in harmful fiber or thread stress, which in turn leads to roughness, yarn hairiness, slub formation, thread breaks and melting points (in synthetics).

The selection of the right traveler number is increasingly important. A specific yarn count can generally be achieved using a range of three or four ring traveler sizes. As the ring traveler speeds increase, however, this range narrows to the point where only one or two traveler circumferences will be suitable. This reflects the importance of choosing the right traveler size.

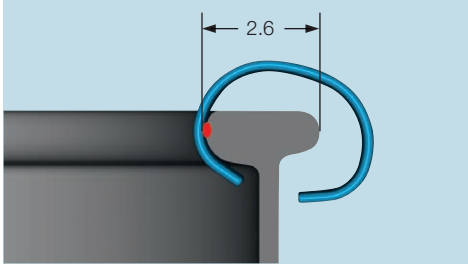
However, the exact traveler size cannot be calculated in advance since there are many factors that can vary between companies and will influence the determination of the traveler size. For example, the friction conditions of the traveler on the ring (condition of the rings, lubrication, number of spindle revolutions, etc.), air conditioning during operation, the type of winding, yarn twist and fiber material quality all affect the choice of traveler size.

This means the traveler weight must be determined in practical tests.



## Traveler Delivery Program for T-Flange Rings

### Flange ½

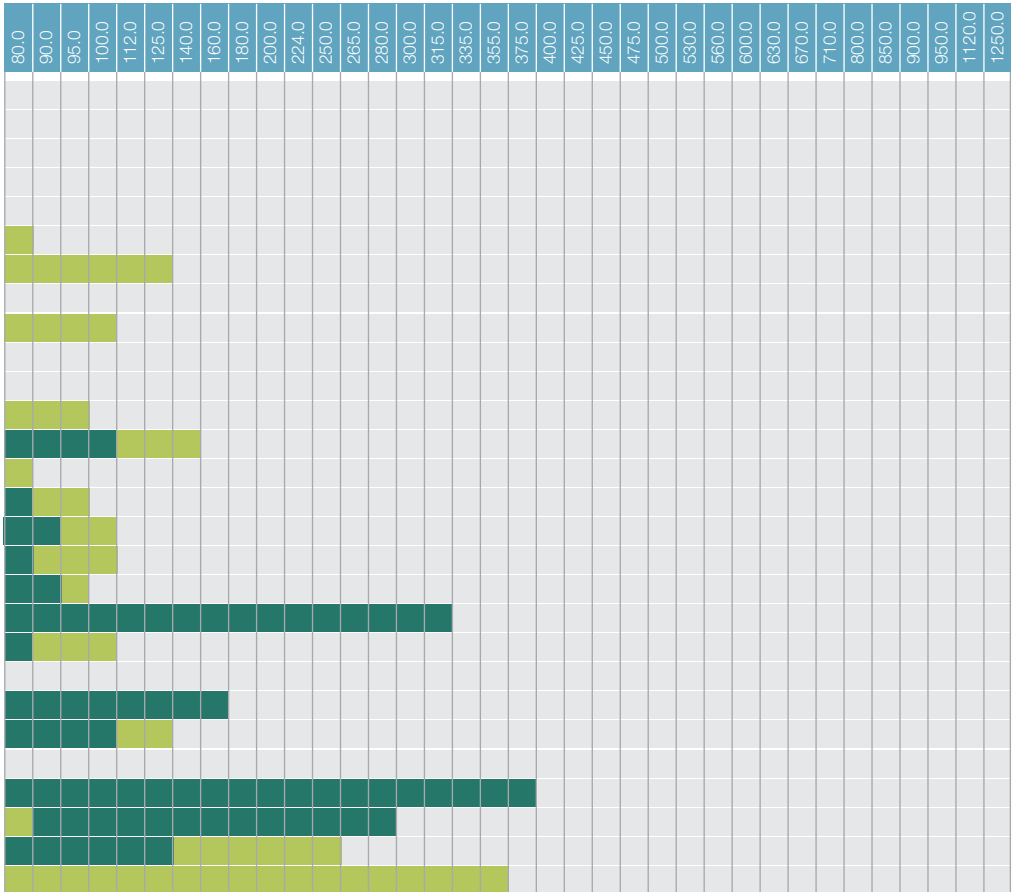


Traveler type	Shape	Wire cross section	Traveler no.																										
			5.6	6.3	7.1	8.0	9.0	10.0	11.2	12.5	13.2	14.0	15.0	16.0	17.0	18.0	20.0	22.4	23.6	25.0	28.0	31.5	35.5	40.0	45.0	50.0	56.0	63.0	71.0
C ½ EL		udr																											
C ½ UL		dr																											
C ½ UM		udr																											
C ½ EM		f																											

■ Traveler no.    
 ■ Delivery program    
 ■ Most recommended

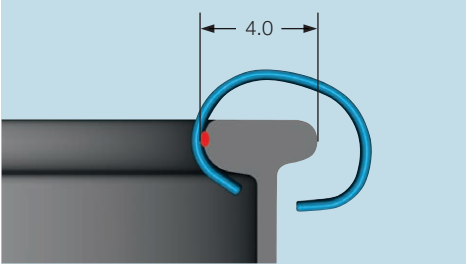
80.0	
90.0	
95.0	
100.0	
112.0	
125.0	
140.0	
160.0	
180.0	
200.0	
224.0	
250.0	
265.0	
280.0	
300.0	
315.0	
335.0	
355.0	
375.0	
400.0	
425.0	
450.0	
475.0	
500.0	
530.0	
560.0	
600.0	
630.0	
670.0	
710.0	
800.0	
850.0	
900.0	
950.0	
1120.0	
1250.0	





## Traveler Delivery Program for T-Flange Rings

### Flange 2



Traveler type	Shape	Wire cross section	Wire Size (mm)																										
			5.6	6.3	7.1	8.0	9.0	10.0	11.2	12.5	13.2	14.0	15.0	16.0	17.0	18.0	20.0	22.4	23.6	25.0	28.0	31.5	35.5	40.0	45.0	50.0	56.0	63.0	71.0
M 2		udr																											
M 2		dr																											
M 2		f																											
EM 2		dr																											
C 2 UM		udr																											
C 2 MM		dr																											
H 2		dr																											
H 2		f																											
H 2		fr																											
EH 2		dr																											
C 2 HW		dr																											
C 2		f																											
C 2		r																											

■ Traveler no.    
 ■ Delivery program    
 ■ Most recommended













# Ring Traveler Weights



The ring traveler must be able to balance the yarn balloon. Because the balloon varies greatly between the bottom and top of the cop, the ring traveler will usually be too light at the bottom of the cop and too heavy at the top. This means there is always a compromise when choosing the correct ring traveler weight.

## Ring Traveler Weights

Measuring the yarn tension on the ring spinning machine is not practical. The best method is to determine the balloon shape. This can be done using a stroboscope or a flashlight.

Insert ring travelers of two or three consecutive numbers (weights) **after doffing** on a few spindles and look at the balloon.

- 1 Select the ring traveler weight at the bottom of the cop when the bobbin reaches full diameter (Fig. 1)
- 2 The balloon should not touch:
  - Separators
  - Tube tip
  - When using anti-ballooning rings, the lower part of the balloon should be slightly larger in diameter than the upper part
- 3 The balloon should not collapse (double ballooning)
- 4 If the shape of the balloon is stable, the ring traveler weight is correct
- 5 Check the balloon at full cop (Fig. 2):
  - The balloon should not be too straight
- 6 Check the yarn quality with the selected ring traveler weight

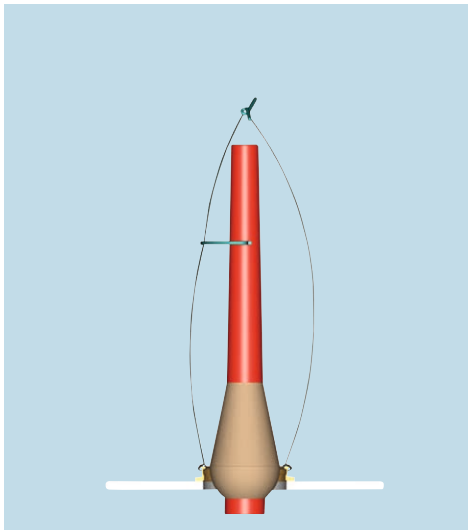


Fig. 1: Cop base with full cop diameter

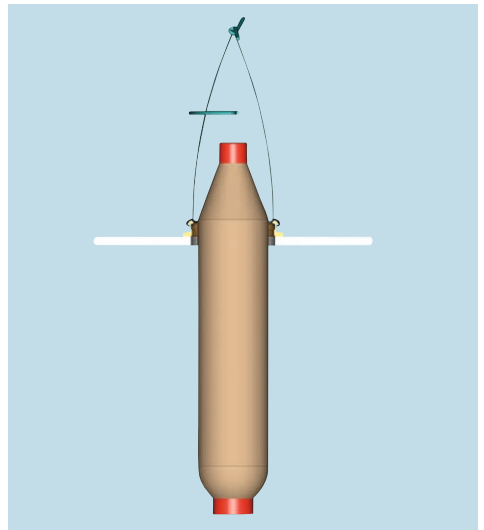


Fig. 2: Full cop



### Ring Traveler Weights for T-Flange, ORBIT and SU

The ring traveler weights are determined not only by the yarn count but also by the following factors:

<b>Fiber type</b>	▶ Synthetics, blends	▶ Number 1–2 heavier ring travelers
<b>Spindle speed</b>	▶ Higher rpm	▶ Lighter ring travelers
<b>Spinning geometry</b>		
• Small ring diameter	▶ Small balloon	▶ Lighter ring travelers
• Large ring diameter	▶ Large balloon	▶ Heavier ring travelers
• Short tube length	▶ Small balloon	▶ Lighter ring travelers
• Long tube length	▶ Large balloon	▶ Heavier ring travelers
• Spinning without anti-balloon ring	▶ Control of the balloon	▶ Heavier ring travelers



Nm	Ne	T-flange		ORBIT	SU	
		Traveler no.	ISO	ISO	PES/blends	PAC and CV
10	6	12–16	200–280			250–315
14	8	10–14	160–250		250–315	200–280
17	10	8–11	125–180	100–140	224–280	140–200
20	12	6–10	100–160	90–125	160–250	100–160
24	14	3–7	80–112	80–112	125–224	90–140
27	16	1–4	63–90	71–100	112–180	80–112
34	20	2/0–2	50–71	56–80	71–140	63–80
40	24	3/0–1	45–63	45–63	63–125	50–71
50	30	6/0–2/0	31.5–50	31–50	56–112	35.5–63
68	40	9/0–5/0	23.6–35.5	22.4–35.5	50–71	31.5–56
85	50	10/0–6/0	22.4–31.5	20–31.5	45–63	28–45
100	60	14/0–9/0	16–23.6	18–25	40–50	
135	80	18/0–12/0	12.5–18	14–20		
170	100	19/0–14/0	11.2–16			
200	120	20/0–18/0	10–12.5			
240	140	22/0–19/0	9–11.2			

The values provided above are guide values.  
The final ring traveler number should be selected through trials.

## Comparison Chart – Flange/Ring Travelers

International standard ISO 96-1 for ring travelers specifies the ring traveler weight in an even percentile grading according to the ISO R20 series.

Ring traveler weights in mg or per  
1 000 ring travelers in g

The weight increases by 12.5% with each number:  
100 + 12.5 % + 12.5 % + 12.5 %...

Exceptions (in brackets): Series R40 = 100 + 6.25 %  
+ 6.25 % + 6.25 %...

Bräcker ring travelers are produced in accordance  
with ISO 96-1.

Conv. ring traveler no.	ISO no. and ring traveler weight in mg					
	BAG	R&F	Carter	Kanal * TM	NFC	LRT
30/0						
29/0	5.6					
28/0	6.3	5	6.3			6.3
26/0	7.1	6	7.1			7.4
24/0	8	7.1	8	9.5	8.4	8
23/0		7.5			9.1	
22/0	9	8	9	10.9	9.7	9
20/0	10	9	10	12.2	11	10
19/0	11.2	10	11.2	12.9	11.7	11.2
18/0	12.5	11.2	12.5	13.5	12.3	12.5
17/0	13.2	11.8	13.2	14.3	13	13.2
16/0	14	13.2	14	15.3	13.9	14
15/0	15	14	15	16.4	14.9	15
14/0	16	15	16	17.8	16.2	16
13/0	17	16	17	20	17.8	17
12/0	18	18	18	21.6	19.4	18
11/0	20	19	20	23.2	21.1	20
10/0	22.4	20	22.4	25	22.7	22.4
9/0	23.6	22.4	23.6	26.8	24.3	23.6
8/0	25	23.6	25	28.5	25.9	25
7/0	28	26.5	28	30.2	27.5	28
6/0	31.5	30	31.5	32.2	29.2	31.5
5/0	35.5	31.5	35.5	35.1	32.4	35.5
4/0	40	35.5	40	38.3	35.6	40
3/0	45	40	45	42.2	39	45
2/0	50	45	50	48.3	45	50
1/0	56	50	56	54.6	52	56
1	63	60	63	62.2	58	63
2	71	71	71	73.6	71	71

Conv. ring traveler no.	ISO no. and ring traveler weight in mg					
	BAG	R&F	Carter	Kanal * TM	NFC	LRT
3	80	80	80	81	78	80
4	90	85	90	87.7	84	90
5	95	95	95	95.3	91	95
6	100	106	100	108.8	104	100
7	112	112	112	121.8	117	112
8	125	125	125	135.9	130	125
9	140	140	140	154.4	149	140
10	160	160	160	174.8	169	160
11	180	180	180	204.1	194	180
12	200	200	200	224.2	214	200
13	224	224	224	244.2	233	224
14	250	236	250	264.3	253	250
15	265	250	265	283.3	272	265
16	280	265	265	297.4		280
17	300	280	280	310.8		300
18	315	300	300	324		315
19	335	315	315	337.4		335
20	355	325	325	350.6		355
22	375	355	355	377.5		375
24	400	385	385	404.1		400
26	425	415	415	430.6		425
28	450	450	450	456.2		450
30	475	475				475
32	500					
34	530					
36	560					
38	600					
40	630					

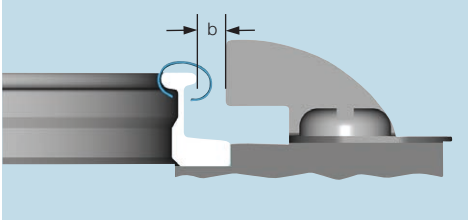
16.0

Example: Travelers with the same weight may have different conventional ring traveler numbers depending on the manufacturer.

\* main types

## Setting of the Ring Traveler Cleaner

### Flange ½ and Flange 1



### Radial Ring Traveler Cleaner

- Under no circumstances should the ring traveler touch the cleaner (yarn breaks, ring damage)
- The largest value should be set by applying different ring traveler types and/or numbers

Ring traveler		b				
Type	Profile	≤ 9/0	8/0–4/0	3/0–3	4–10	11–16
C ½ EL	udr	1.6	1.6			
C ½ UL	dr	1.6	1.6			
C ½ UM	udr	1.6	1.6			
C ½ EM	f	1.6	1.6	1.6		
C 1 SKM	udr	1.8	1.8			
C 1 SKL	udr	1.8	1.6			
C 1 SEL	udr	1.8	1.8			
C 1 EL/EL 1	f, dr, udr	1.9	2.1	2.1		
C 1 SL	dr, udr	1.8	1.8	2.1		
L 1	f, udr	1.6	2.0	2.1		
C 1 UL	f, udr	1.8	1.8	2.1	2.3	
M1	r, dr, udr	1.9	2.1	2.2	2.6	
EM 1	f, dr, udr	1.9	2.1	2.2	2.6	3.0
	fr	2.7	2.7	3.0		
C 1 UM	udr	1.7	1.7	1.9	2.2	
C 1 LM	udr	1.9	2.1	2.3	2.5	
C 1 MMS	udr	1.9	2.1	*1)	*2)	*3)
C 1 MM	udr	1.9	2.1	*1)	*2)	*3)
C 1 HW	dr			3.7	4.0	4.0
C 1 HW	dr				4.0	4.0
C 1 SH	fr		3.7	4	4.1	5.2
ISO no.		≤ 23.6	25–40	45–80	90–160	180–280

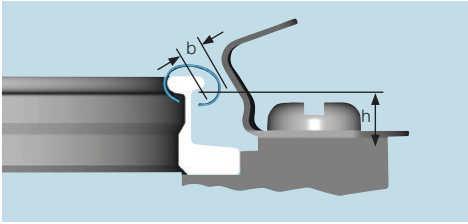
\*1) No. 1–6 = 2.6

\*2) No. 7–10 = 3.0

\*3) No. 13–22 = 3.5

 Traveler no.

## Flange ½ and Flange 1

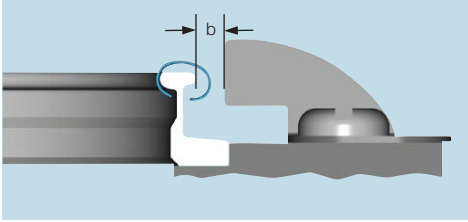


### Tangential Ring Traveler Cleaner (flange 1, udr, dr and f profile only)

- Suitable for high-speed ring travelers
- Recommended for all compact-spinning processes
- Advantages: more efficient cleaning of the ring traveler, prevention of fiber accumulation
- Important: the tangential ring traveler cleaner must be installed with a distance **h = 4.5 mm** to the flange crown

Traveler no.	26/0–11/0	16/0–6/0	8/0–1	3/0–6	4–12
Distance b	1.8	2.0	2.2	2.4	2.8
ISO no.	7.1–20	14–31.5	25–63	45–100	90–200

**Flange 2**



**Radial Ring Traveler Cleaner**

- Under no circumstances should the ring traveler touch the cleaner (yarn breaks, ring damage)
- The largest value should be set by applying different ring traveler types and/or numbers

Ring traveler		b						
Type	Profile	≤ 11/0	10/0–4/0	3/0–3	4–10	11–14	16–20	22–36
M2	f, dr, udr	1.9	2.1	2.2	2.4			
EM 2	dr		2.2	2.4	2.8			
C 2 UM	udr		1.7	1.9	2.1			
C 2 MM	dr		2.4	2.4	3.0	3.3	3.3	
H2	f, dr			2.2	2.6	3.0	3.3	
	fr		3.0	3.0	3.5	3.6		
EH 2	dr		2.4	2.8	3.1	3.3	3.6	
C2 HW	dr			3.0	3.2	3.3	3.4	
C 2	f			*1)	*2)	*3)	*4)	*5)
ISO no.		≤ 20	22.4–40	45–80	90–160	180–250	280–355	375–560

\*1) No. 1–6 = 2.1

\*3) No. 10–18 = 3.1

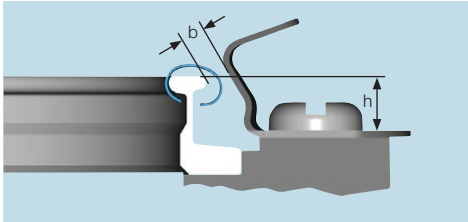
\*5) No. 30–35 = 5.0

\*2) No. 7–9 = 2.7

\*4) No. 20–28 = 3.8

 Traveler no.

## Flange 2



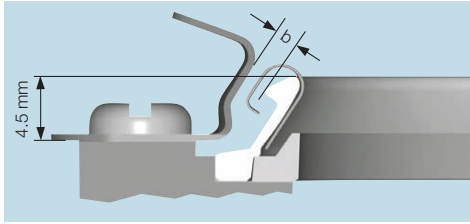
### Tangential Ring Traveler Cleaner (flange 2, udr, dr and f profile only)

- Suitable for high-speed ring travelers
- Recommended for all compact-spinning processes
- Advantages: more efficient cleaning of the ring traveler, prevention of fiber accumulation
- Important: the tangential ring traveler cleaner must be installed at a distance  $h = 4.5 \text{ mm}$  to the flange crown

Traveler no.	12/0-4/0	6/0-8	3-36
Distance b	2.8	3.3	4.1
ISO no.	18-40	31.5-125	80-560



**ORBIT**



**Tangential Ring Traveler Cleaner**

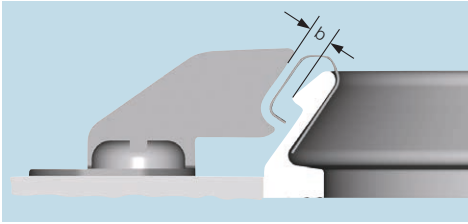
Caution! Under no circumstances should the ring traveler touch the cleaner.

The ring traveler number used at the end of the ring running-in program, i.e. the one for normal operation, is decisive.

Mounting height of the tangential cleaner: **4.5 mm** below the ring crown.

**Guide value setting “b”:**

Traveler no. (ISO)	b
12.5–40	1.5 mm
28–80	1.9 mm
63–125	2.2 mm

**SU****Guide value setting “b”:**

Traveler no. (ISO)	b
< 63	1.7 mm
56–112	1.9 mm
> 100	2.1 mm

# Application Recommendations

The optimal performance can be achieved by selecting the correct Bräcker ring traveler type. The ring traveler shape, wire cross section, weight and finish all have a significant impact on the productivity of a ring spinning machine and the yarn quality. The following charts serve as a guide for selecting the correct Bräcker ring travelers.

## Spinning Regular Yarns

### Recommendations for Bräcker Ring Travelers for T-Flange, ORBIT and SU Rings

Fiber	Cotton				
	Ne 6–16	Ne 14–34	Ne 30–50	Ne 40–80	Ne 60–140
Flange ½			<b>C ½ UM udr</b>  C ½ EL udr C ½ EM f	<b>C ½ UM udr</b> <b>C ½ EL udr</b>  C ½ UL dr C ½ UL dr	<b>C ½ UM udr</b> <b>C ½ EL udr</b>  C ½ EM f
Flange 1	<b>C1 MM udr</b> <b>M1/EM1 dr</b> <b>C1 UM udr</b>  C1 HW dr M1/EM1 udr M1 f/EM 1 f	<b>C1 MM udr</b> <b>C1 UM udr</b> <b>C1 LM udr</b> <b>M1/EM 1 udr</b>  M1/EM1 dr C1 UL udr C1 UM udr	<b>C 1 MM udr</b> <b>C1 MMS udr</b> <b>C 1 UL udr</b> <b>C1 LM udr</b>  C1 SL udr C1 EL udr EL 1 f M1 f/EM1 f	<b>C1 UL udr</b> <b>C 1 MM udr</b> <b>C1 EL udr</b> <b>C1 SL dr/udr</b>  EM 1 udr L 1 f UL1 f L1 udr	<b>C1 EL udr</b> <b>C1 UL udr</b> <b>C1 SL dr/udr</b> <b>C1 SEL udr</b>  L1 f EL1 f  L1 udr
Flange 2	<b>C2 HW dr</b> <b>H2/EH2 dr</b> <b>C2 MM dr</b>  EM 2/M2 dr H2 f M2 f	<b>C2 MM dr</b> <b>EM 2/M 2 dr</b> <b>M 2 udr</b>  H2 dr/EH2 dr C2 UM udr			
ORBIT		<b>SFB PM dr</b> <b>SFB PM udr</b>	<b>SFB 2.8 PM udr</b> <b>SFB 2.8 PM dr</b>  SFB 2.8 RL dr	<b>SFB RL udr</b> <b>SFB 2.8 PM udr</b>  SFB RL dr	<b>SFB 2.8 PM udr</b> <b>SFB 2.8 RL dr</b>  SFB PM dr
SU		<b>SU-B drh</b>			

Ring travelers in **bold** are most commonly used

## Spinning Synthetic Regular and Compact Yarns

### Recommendations for Bräcker Ring Travelers for T-Flange, ORBIT and SU Rings

Fiber	Polyester/viscose/blends		PAC/blends
	Ne 6–24	Ne 20–60	Ne 6–40
Flange ½		<b>C ½ EM f</b> <b>C ½ UL dr</b>	
Flange 1	<b>M1/EM 1 dr</b> <b>C1 HW dr</b> <b>C1 MM udr</b> <b>C1 UM udr</b>  C1 LM udr EM1 udr	<b>C1 MM udr</b> <b>M1/EM 1 udr</b> <b>C1 LM udr</b> <b>C1 UM udr</b>  M 1/EM 1 dr C1 UL udr C1 SL dr	<b>C1 SM fr</b> <b>M1/EM 1 dr</b> <b>C1 HW dr</b> <b>EM 1 fr</b>  C1 SH fr M1/EM1 udr
Flange 2	<b>H2/EH 2 dr</b> <b>M2/EM 2 dr</b>  C2 MM dr C2 HW dr	<b>M2/EM 2 dr</b> <b>C 2 MM dr</b>  H2/EH 2 dr C2 UM udr	<b>H 2/EH 2 dr</b> <b>H2 fr</b>  C2 MM dr C2 UM udr
ORBIT		<b>SFB 2.8 PM dr</b> <b>SFB 2.8 PM</b> <b>SFB 2.8 RL udr</b>	SFB 2.8 PM dr
SU	<b>SU-B drh</b> <b>SU-BM drh</b>	<b>SU-B drh</b> <b>SU-BF udr</b>  SU BM drh	<b>SU-BM drh</b> <b>SU-B drh</b>  SU-BF udr

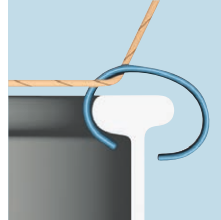
Ring travelers in **bold** are most commonly used

### Spinning Synthetic (PES, PAC) and Blended Yarns

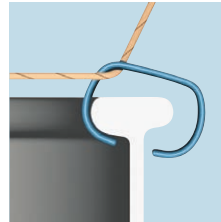
Fibers made from synthetic polymers have different characteristics. Most of these fibers are sensitive to heat and mechanical damages. Therefore, the instructions of the fiber manufacturer must be followed.

The ring traveler speeds are limited due to following reasons: Spinning with excessive ring traveler speeds can cause thermal fiber damage that is only visible after the dyeing process.

Dyed or dull fibers often contain abrasive components that can reduce the service life of travelers and rings.



If the yarn is close to the ring crown, thermal damage can occur.



Ring travelers with defined yarn passage position can help to prevent fiber damage.

### Rings:

TITAN flange 1 and 2 rings are recommended for the entire range of application. THERMO 800 flange 1 and 2 rings can be used for lower spindle speeds.

The ORBIT flange ring has a large ring/traveler contact area, which helps to avoid thermal damages that usually occur at higher ring traveler speeds.

The SU flange rings with a large ring/traveler contact area are recommended for coarse to medium yarn counts.

### Ring travelers:

To avoid fiber damage, higher bowed travelers with a dr or fr profile can be used.

### Ring traveler finishes and treatments:

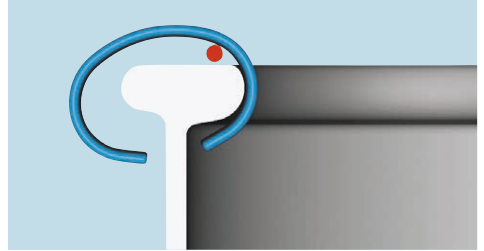
STARLET, STARLET*plus*, CARBO or PYRIT can help to increase the ring traveler service life under critical conditions, while SAPHIR is recommended for normal conditions.

## Spinning Compact Yarns

Processing cotton on compact machines is now one of the most popular solutions on the market. Compact yarns have significantly lower yarn hairiness. Therefore, the fiber lubrication requirement for the ring and traveler system is low.

This yarn also has a higher yarn tenacity, which makes it suitable for higher spindle speeds.

Only by using optimally matched rings and ring travelers can the compact yarn be spun at the highest spindle speeds while ensuring the maximum ring traveler service life.



C1 EL udr ring traveler with a small yarn clearance

### Rings:

TITAN flange rings are recommended for the entire range of application.

### Ring travelers:

Low yarn clearance and an ultra-half round “**udr**” profile can be used for almost all yarn counts.

### Ring traveler finishes and treatments:

SAPHIR for high performance.  
 ONYX, PYRIT for high performance and longer ring traveler service life.  
 ZIRKON for high performance and maximum ring traveler service life.



Conventional yarn



Compact yarn

## Ring Traveler Recommendation

Yarn count (Ne)		8	10	12	14	16	20	24	30	36	40	50	60	70	80	100	120	140	
Carded and combed cotton	Flange 2		M2 udr/dr																
	Flange 1			C1 UL udr/C1 MM udr/C1 MMS udr															
								C1 SL udr/C1 SLM udr											
											C1 EL udr/C1 ELM udr								
	SFB											C1 SKL udr/C1 SKM udr							
												CL udr							

Delivery program     Most recommended

## Spinning Slub Yarns

Slub yarns (fancy yarns) are growing in importance. A slub yarn enables innovative solutions for new fabric creations.

Slub yarns are yarns with defined mass variation in terms of length and thickness. Slub yarns are produced individually according to the customer's requirements.

When choosing the ring traveler, the length, thickness and frequency of the slubs are important.

### Rings:

TITAN, THERMO 800, flange 1, flange 2 for coarse yarn counts.

### Ring travelers:

Ring travelers with high bow to ensure sufficient space for the slubs; a **dr** profile enables smooth passing of the slubs. The ring traveler weight depends on the mass variation of the slubs, and in general a higher weight is required compared to regular yarn. It is important that the ring traveler weight is sufficient to control the balloon.

### Ring traveler finishes and treatments:

SAPHIR, STARLET and STARLET*plus* for high performance. PYRIT for high performance and longer ring traveler service life.

## Ring Traveler Recommendation

Yarn count (Ne)		Coarse yarn counts/slubs				Medium yarn counts/slubs				Fine yarn counts/slubs			
Slub and fancy yarns	Flange 2	C2 HW dr											
		H2 dr/EH2 dr											
						C2 MM dr							
	Flange 1	C1 HW dr											
						EM1/M1 dr							
SFB									C1 MM udr				
						2.8 PM r							

Due to the wide variety of slub or fancy yarns, only a general recommendation can be made.





## Spinning Hard Core Yarns (PES)

This refers to yarns with a (polyester) filament in the center and staple fibers twisted around, which are primarily polyester or cotton.

Hard core yarns are used for sewing thread. Due to the smooth surface of the filament, if a very delicate yarn is used for spinning, the wrapping fibers do not adhere sufficiently and may be pushed back.

### Rings:

TITAN or THERMO 800, flange 1, flange 2 for coarse yarn counts.

### Ring travelers:

High-bowed ring travelers with an **fr** profile or a **dr** profile. Traveler speed 20–25 m/sec. Higher ring traveler weights compared to normal spinning.

### Ring traveler finishes and treatments:

SAPHIR and STARLET for high performance. PYRIT or ZIRKON for high performance and longer ring traveler service life.

### Ring Traveler Recommendation

Yarn count (Ne)		8	10	12	14	16	20	24	30	36	40	50	60	70	80	
Hard core yarn (PES)	Flange 2	H2 fr														
		H2 dr/C2 HW dr														
								M2 dr								
	Flange 1	C1 SH fr														
			C1 SM fr								EM 1 fr					
								EM 1 dr								

# Lubrication of Ring/ Ring Traveler System

In short staple spinning, the ring/ ring traveler system performs under so-called “dry lubrication” conditions, whereby no lubricants, such as oil, are actively added. The necessary lubricants between ring and ring traveler are provided by the fibers. In the case of cotton, fiber fragments and natural cotton wax build up the lubrication film. When man-made fibers are being spun, a spinning finish is added by the fiber manufacturer.

## Yarn Clearance

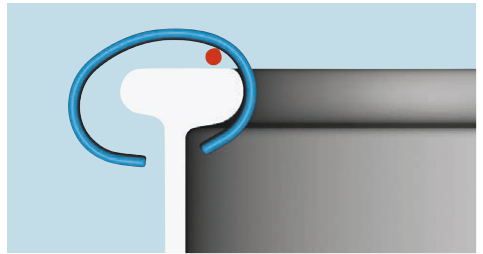
The yarn clearance must be adapted to the yarn count, yarn twist (volume) and the fibers being processed. This is achieved by selecting the optimal ring traveler type.

The yarn clearance also influences the lubrication of the ring/ring traveler system.

- Reduced yarn clearance > Good lubrication
- Large yarn clearance > Reduced lubrication

### Ring Traveler with Small Yarn Clearance

- Low center of gravity
  - For fine cotton yarns
  - For compact yarns
- Optimal ring lubrication



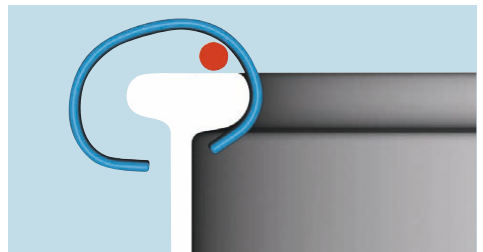
### Ring Traveler with Medium Yarn Clearance

- Small to medium yarn clearance for fine to medium cotton yarns
- Normal ring lubrication

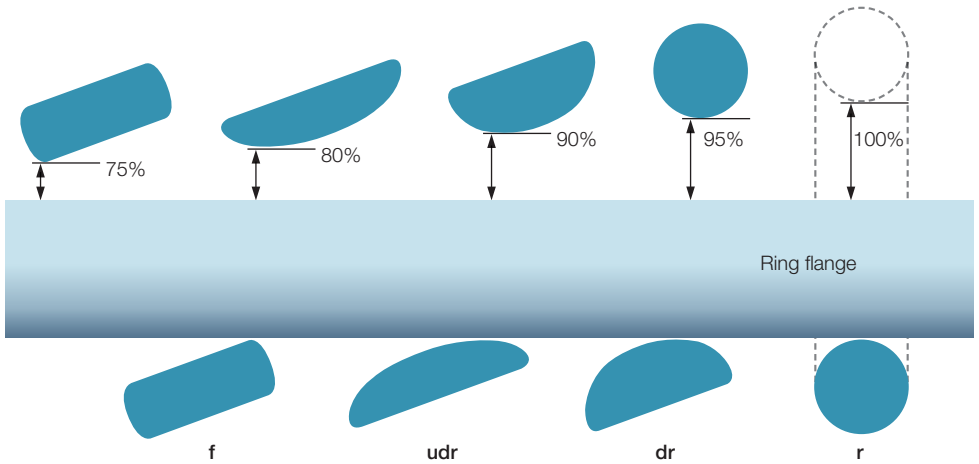


### Ring Traveler with Large Yarn Clearance

- Large yarn clearance for medium to coarse cotton yarns, also suitable for blends and synthetics
- Reduced ring lubrication



**Influence of the Wire Cross Section on Yarn Passage with an Inclined Ring Traveler**



The usual ring traveler inclination is between 5° and 20°. Inclination is usually determined by the yarn tension, the balloon shape, and the wire cross section, which in turn depend on:

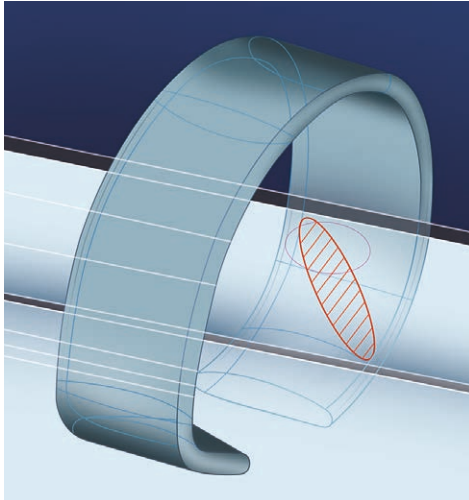
- Ring traveler weight
- Ring traveler shape
- Speed
- Fiber lubrication
- Ring running surface condition
- Fiber friction at the yarn passage (lubrication, neps, slubs)

A higher yarn tension generally increases the ring traveler inclination.

**Important:**

The shape, wire cross section and ring traveler weight must be adjusted to the material to be processed or the actual conditions.

### Examples of Ring Traveler Positions



////// Contact area

## Influence on the Lubrication of the Ring/Ring Traveler System

The required yarn clearance in the ring traveler must be selected according to the yarn count and the fibers processed. It is determined by the ring traveler shape and the inclination of the ring traveler.

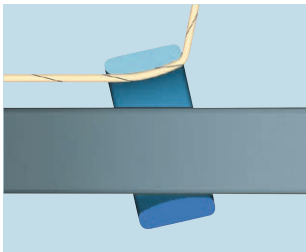
### Effects of the Yarn Clearance on the Yarn Quality and the Running Behavior of the Ring Traveler

	Small, low	Large, high
Yarn count	Fine	Coarse
Fiber	Cotton	Synthetics, blends
Influence on lubrication film	Good ring traveler lubrication	Reduced ring traveler lubrication
Influence on yarn quality	Danger of "push-back" neps and melting points (on synthetics)	Excellent yarn quality guaranteed

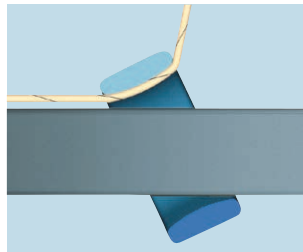
The inclination of the ring traveler is primarily influenced by the spinning geometry and the spinning tension. The greater the inclination of the ring traveler, the more the yarn clearance is reduced and the better the ring lubrication.

The following images show the influences of the ring traveler shape and inclination:

#### Inclination



Medium inclination



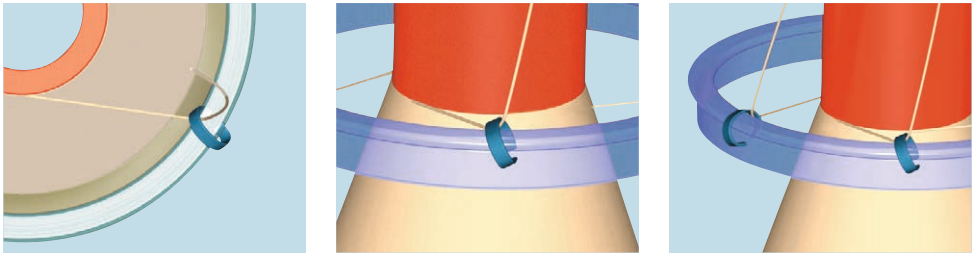
Strong inclination

### Tensile Forces of the Yarn Balloon

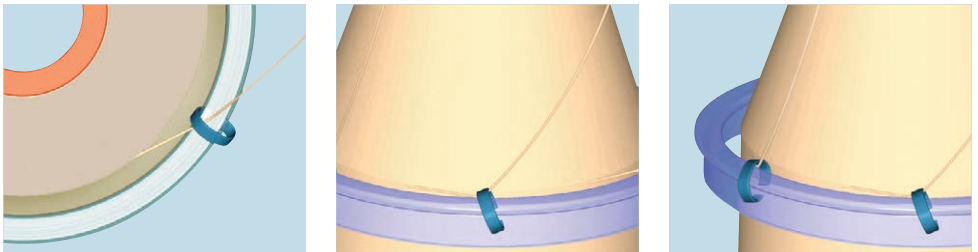
The ring traveler is subject to tensile forces from the yarn balloon. This makes it very difficult to define the contact area between the ring and ring traveler.

By combining the arc radius of the ring traveler with its wire profile, the desired large ring traveler contact area is already achieved during the commissioning of a newly inserted ring traveler.

Ring traveler position and balloon shape **on the top** of the taper during spinning/winding



Ring traveler position and balloon shape **on the base** of the taper during spinning/winding





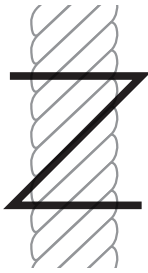
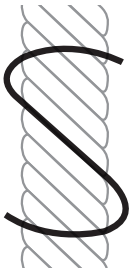
## Twist

### Twist Factor and Coefficient of Twist

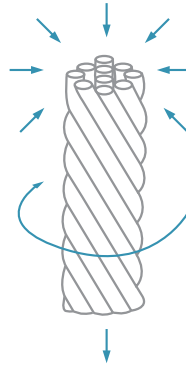
The twist factor or coefficient of *twist a* is used as a directly comparable measure of *twist m* yarns of different counts. The coefficient of twist cannot be calculated; it is an empirical value. Since no international standard exists, different values are used.

The stages are roughly as follows:

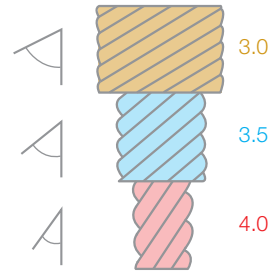
- Using the English system between 1.5 and 6
- Using the metric system between 45 and 180
- Using the tex system, between 1 500 and 6 000



Yarn twist in S or Z direction

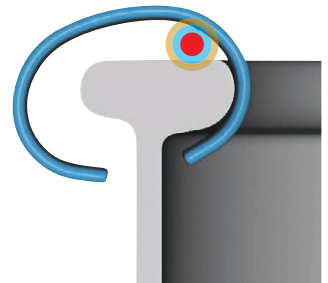


Yarn twist increases yarn tenacity



Alpha of twist

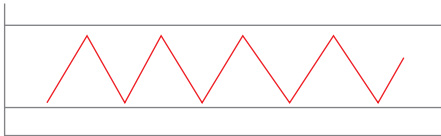
- A yarn with higher yarn twist requires less space in the thread passage.
- A yarn with a lower yarn twist requires more space in the thread passage.
- To ensure that the optimal ring traveler shape is maintained, it is essential that the ring traveler shape is also taken into account when changing the yarn twist.



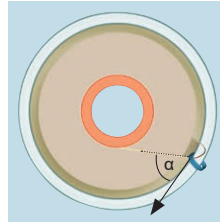
## Motions of the Ring Traveler

One of the important tasks of the ring traveler is to level out the different balloon forces. The following factors are decisive:

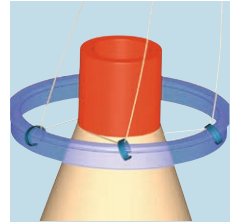
- Ring rail stroke build-up of the cop (influence of tube length)
- Ring rail stroke during one traverse (small/large cop diameter) determines the ring traveler pulling angle ( $\alpha$ )
- Variations of speeds over cop build-up
- Coefficient of friction ring/ring traveler (ring lubrication)
- Changes in yarn tension due to winding with smaller and larger cop diameter (angel  $\alpha$ )



### Top of taper

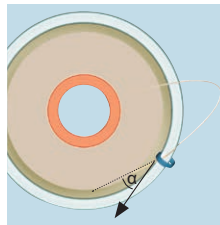


Spinning on empty tube:  
 $\alpha$  large

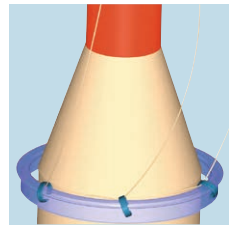


Tight balloon

### Bottom of taper



Spinning on full cop:  
 $\alpha$  small



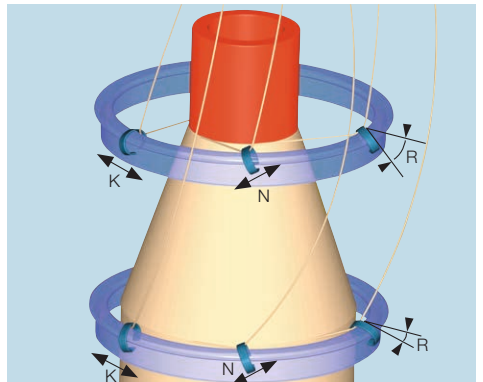
Soft balloon

The ring traveler changes its position while on the spinning ring in addition to the circular movement in three different directions:

- Tilting motion K
- Pitching motion N
- Radial motion R

## Conclusion

The ring traveler is the balancing element in the spinning process. The correct adjustment and choice of ring traveler under consideration of all these factors is decisive for the performance and the yarn quality.



# ORBIT and SU Ring/ RingTraveler System

Designed with a larger contact area between the ring and ring traveler, the unique ORBIT and SU ring/ ring traveler system enables higher productivity, especially when spinning heat-sensitive raw materials.

## ORBIT and SU Ring/ Ring Traveler System

The ORBIT ring/ ring traveler system (international patent) is designed for spinning at top speeds whilst producing highest yarn quality.

### The special features of the ORBIT system are:

- Large contact area between ring traveler and ring reduces the specific pressure
- Optimal heat dissipation from ring traveler to ring

### Key customer benefits when using ORBIT and redORBIT rings:

- Increase in speed, therefore enabling production up to 15%
- Greater stability in ring traveler running behavior and longer ring traveler service life
- Results in reduced yarn breaks
- Consistent and improved yarn quality including core yarn
- Less thermal damage to heat-sensitive fibers and soft cores

### Application fibers:

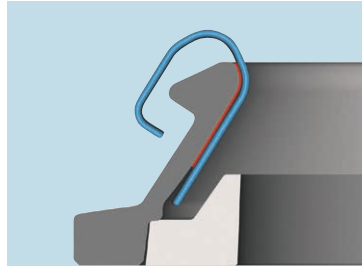
- Regular/compact cotton
- 100 % MMF or blends, combed cotton and other fibers and blends
- Core yarns
- redORBIT IDs of 36 mm, 38 mm, 40 mm, 42 mm and 44 mm

### Yarn count range:

- Ne 20 to Ne 100 recommended
- Finer and coarser counts possible









### Specific requirements:

- Well-controlled and clean environment in the spinning mill
- Well-maintained ring frame (to achieve higher speeds)



■ Contact surface

## Ring Travelers for ORBIT Rings

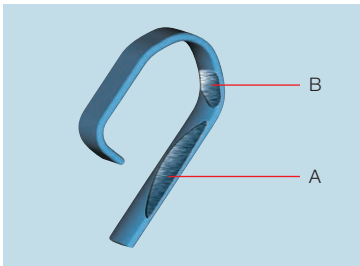
Shape	Designation	Profile	ISO number range	Application
	SFB 2.8 PM	dr 	12.5–140	<ul style="list-style-type: none"> <li>• Cotton</li> <li>• Polyester</li> <li>• Blends, medium–coarse</li> </ul>
		udr 	14–100	<ul style="list-style-type: none"> <li>• Cotton</li> <li>• Blends</li> <li>• Compact yarns, Ne 36 and coarser</li> </ul>
	SFB 2.8 RL	dr 	12.5–100	<ul style="list-style-type: none"> <li>• Cotton</li> <li>• Blends, fine yarn counts</li> <li>• Compact yarns, Ne 30 and finer</li> </ul>
		udr 	12.5–100	<ul style="list-style-type: none"> <li>• Cotton</li> <li>• Blends, fine yarn counts</li> <li>• Compact yarns, Ne 30 and finer</li> </ul>
	SFB 2.8 CL	udr 	13.2–31.5	<ul style="list-style-type: none"> <li>• Cotton</li> <li>• Fine compact yarns</li> <li>• High speed</li> </ul>

### Ring Traveler Wear and Tear



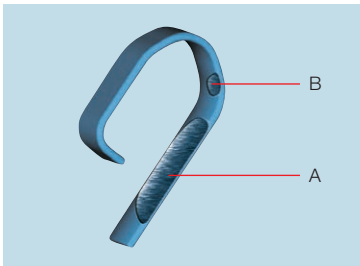
#### Ring traveler weight OK

Optimal wear distribution



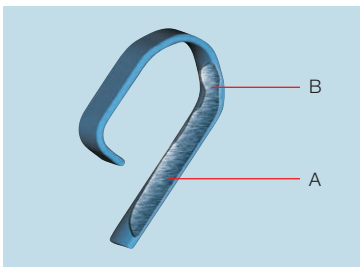
#### Ring traveler weight too heavy

Excessive wear in area B



#### Ring traveler weight too light

Excessive wear in area A



#### Significant ring traveler wear – possible remedies:

If the ring travelers have more than 10 % wear:

- Reduce changing cycle of ring travelers
- Reduce spindle speed
- Check the rings
- Possibly change ring traveler shape, wire cross section or ring traveler weight

## SU Ring/Ring Traveler System

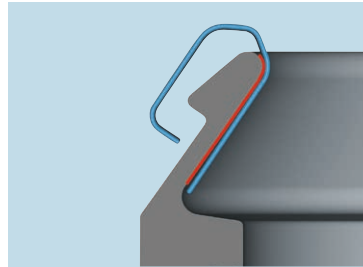
The SU ring/ring traveler system is suitable for processing synthetics (PAC, CV, PES) and their blends in the medium to coarse yarn count range (recommended up to Ne 36). In some cases the conical, lubricated rings can be replaced by the SU ring/ring traveler system.

The design features of the SU system are:

- Large contact area between the ring and ring traveler reduces the specific pressure
- Optimal heat dissipation from ring traveler to ring







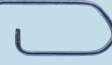

The SU ring/ring traveler system offers the following advantages:

- No lubrication required (as against conical rings; not suitable for wool and wool blends)
- Better and more even yarn quality
- Consistent yarn tension
- No thermal fiber damage
- Longer service life of ring travelers and rings
- Higher spindle speeds
- Lower yarn break rate
- No staining of the yarn



 Contact surface

## Ring Travelers for SU Rings

Shape	Designation	Profile	ISO number range	Application
	SU-B	drh 	28–400	<ul style="list-style-type: none"> <li>• Acrylics</li> <li>• Polyester</li> <li>• Blends</li> </ul>
	SU-BF	udr 	28–90	<ul style="list-style-type: none"> <li>• Viscose</li> <li>• Viscose blends</li> </ul>
	SU-B	r 	35.5–280	<ul style="list-style-type: none"> <li>• Acrylics</li> <li>• Fibers with strong softening agents</li> </ul>
	SU-BM	drh 	35.5–280	<ul style="list-style-type: none"> <li>• Acrylics</li> <li>• Polyester</li> <li>• Blends</li> </ul>

### SU-B

For all synthetics and blends

### SU-BF

For viscose fibers, higher speeds compared to SU-B and SU-BM

### SU-BM

- For all synthetics and blends
- Increased yarn clearance, especially suitable for delicate fibers
- Ring travelers for the SU-rings are inserted with the proven SU RAPID tool (see page 117)

### Finish

- SU ring travelers are available with SAPHIR and STARLET finish
- Ring traveler weights/yarn counts (see page 22)

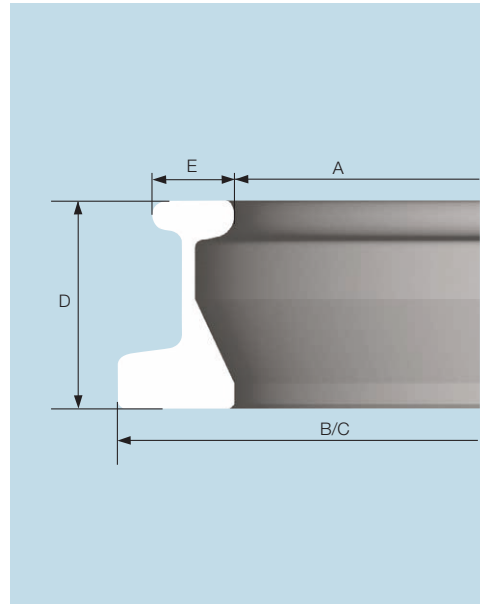
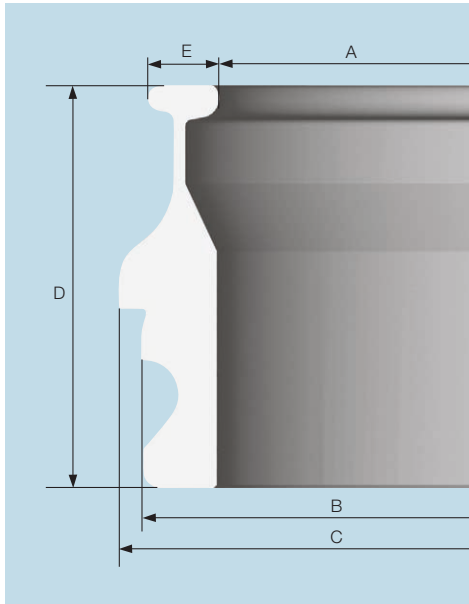


# Rings



Bräcker develops and produces an extensive selection of rings for all requirements in ring spinning. The Bräcker spinning rings are available in all dimensions suitable for ring spinning machines. The consistency of Bräcker ring quality ensures a long service life at high spinning speeds.

## Designation of the Ring Parts – Example for Placing An Order



### Example for Placing An Order – Requesting A Quotation

The following specifications are required:

- A Inner diameter
- B Seat diameter
- C Outer diameter
- D Ring height
- E Flange width

Type	See page	Example
Bräcker ring	60	TITAN
Flange width	E 61	Flange 1; 3.2 mm
Flange profile	61	Normal; N98
Inner diameter	A 59	42 mm
Seat diameter	B 59	51 mm
Outer diameter	C 59	51 mm
Ring height	D 59	8 mm
Machine type		Rieter

## Finishes and Treatments

### TITAN Rings

TITAN rings feature an extremely wear-resistant surface coating.

- High-performance application
- For coarse to fine counts and high speeds
- Compact yarn
- Long service life
- Extremely high wear resistance
- High temperature resistance prevents micro-welding and ring damage
- The running track of the TITAN rings already has an optimal surface for the ring travelers
- Short running-in procedure
- The benchmark for spinning rings



### THERMO 800 rings

THERMO 800 rings are made of tempered steel and are available in flange 1 and 2 designs only.

- For full count range at regular speeds
- For coarse counts (Denim)
- For core yarns (sewing thread)
- Thermo-chemical treatment for universal application

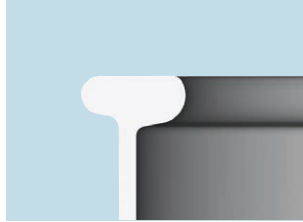


## Ring Profiles

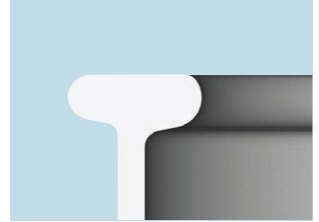
### Flange, ORBIT and SU Rings



**Flange ½**  
Flange width 2.6 mm



**Flange 1**  
Flange width 3.2 mm



**Flange 2**  
Flange width 4 mm



**ORBIT**  
with supporting ring



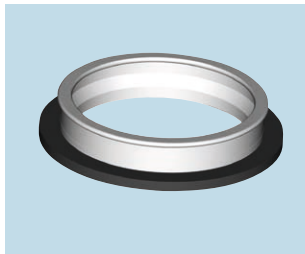
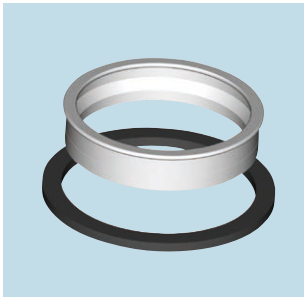
**SU**  
with supporting area;  
also available with supporting ring

## Ring Holder Assembly System (Two-Part Rings)

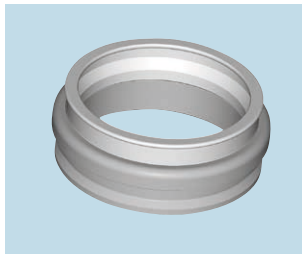
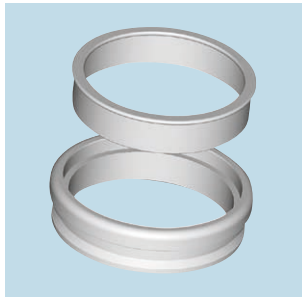
Two-part rings are only available for flange rings with a TITAN finish. Every ring spinning manufacturer has its own system for fixing the rings on the ring rails. The ring flange, which is the most important part, is standardized (ISO 96-1; see also page 59).

The Bräcker ring/holder system consists of the standardized upper ring part and the corresponding holder, which together form the assembly group. The holders are individually designed according to the requirements of the various ring spinning machines. This enables the upper ring part to be standardized in order to offer an economic solution.

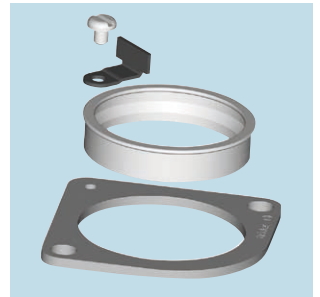
### Ring Assemblies (with standard TITAN rings)



**Assembly with metal foot**  
for all Chinese spinning machines



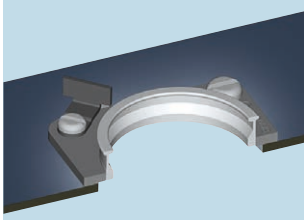
**Assembly with aluminum holder**  
for Toyota, KTTM and Howa



**Assembly with sheet metal holder and ring traveler cleaner**  
for Zinser and Marzoli

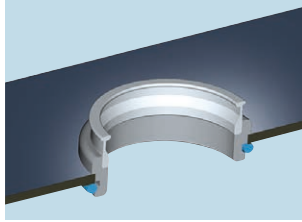
## Fixing Methods

### TITAN Rings with Assembly System (Two-Part Rings)



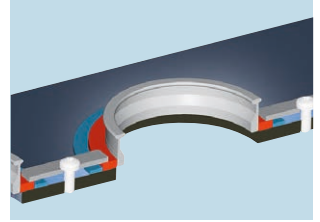
#### Assembly group

Zinser and Marzoli spinning machines



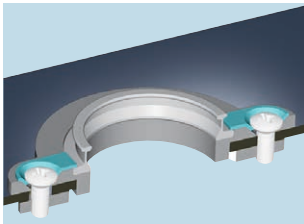
#### Assembly with aluminum holder

Zinser, Howa, Toyota, KTTM  
(circlip fixing)

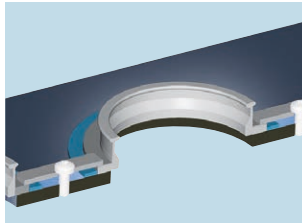


For all Chinese ring spinning machines

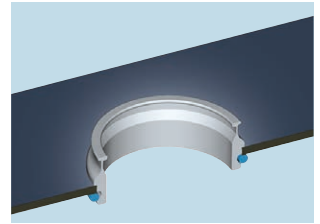
### Solid Rings – TITAN and THERMO 800



Rieter and Lakshmi  
ring spinning machines



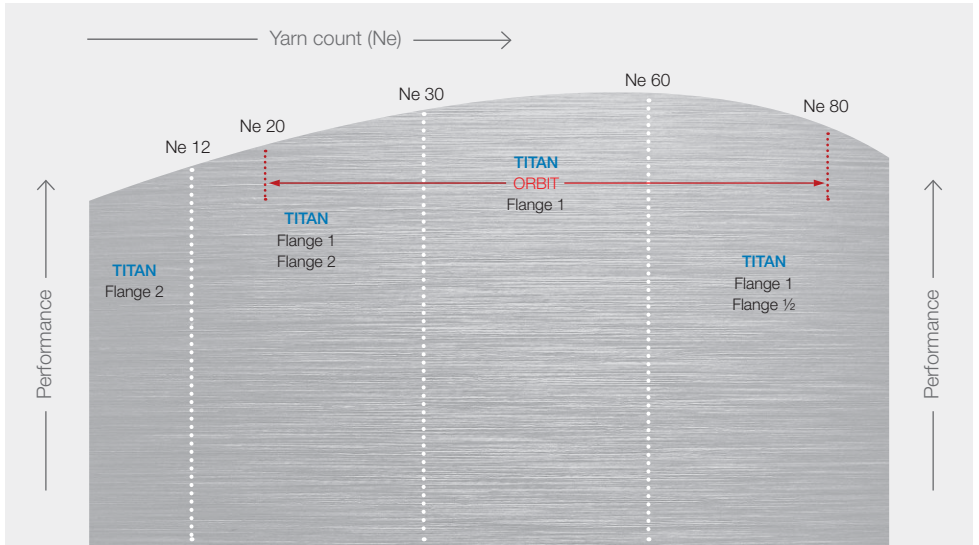
Solid ring for Chinese machines



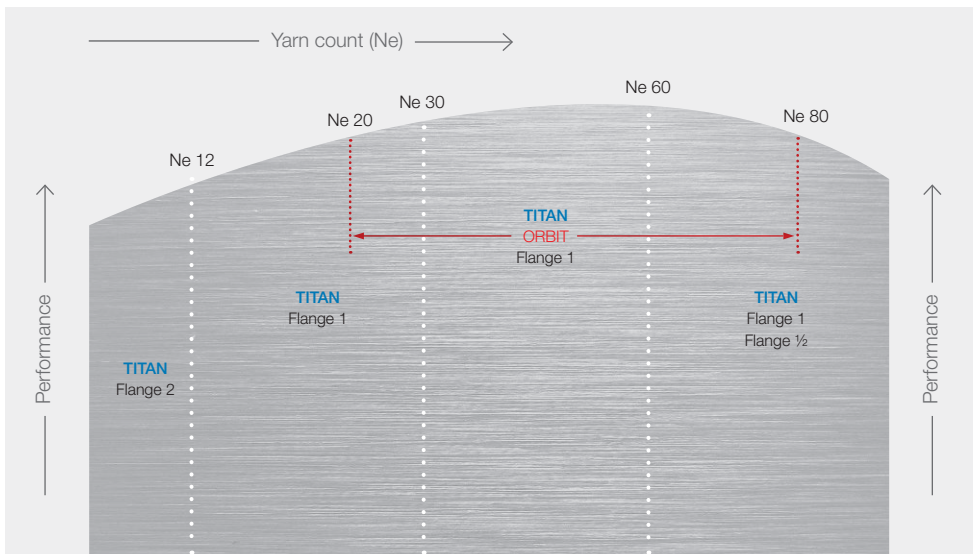
Zinser, Toyota and KTTM and  
Howa ring spinning machines  
(circlip fixing)

## Application Matrix for Bräcker Spinning Rings

### Conventional Cotton

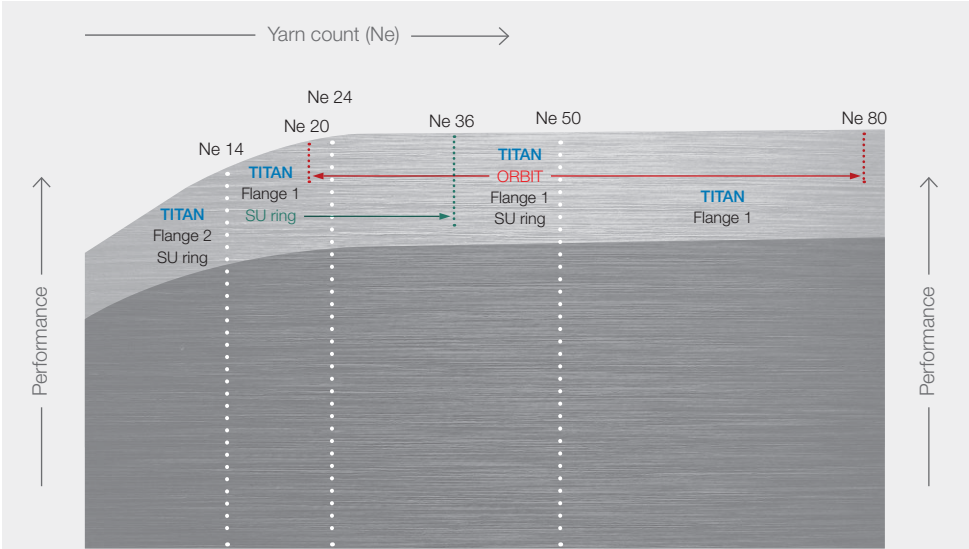


### Compact Cotton

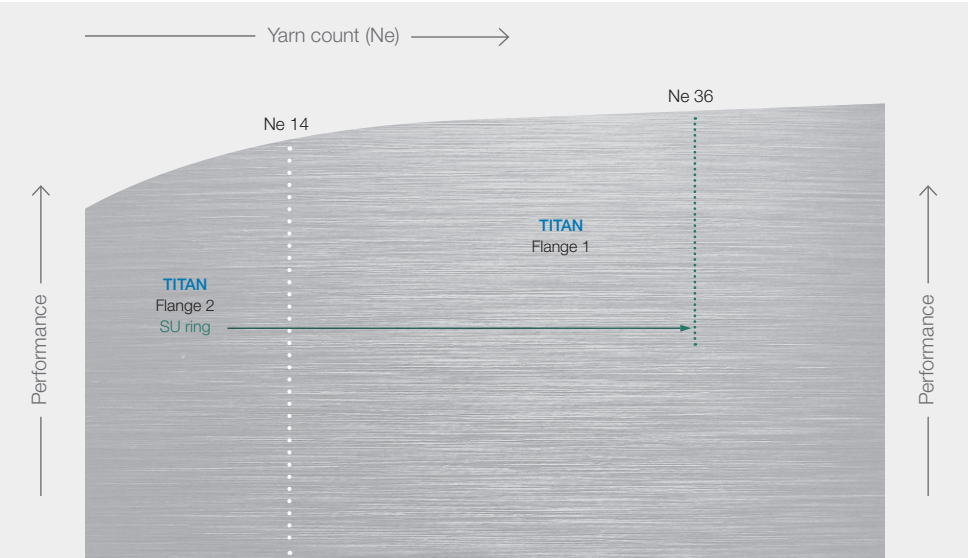


# Application Matrix for Bräcker Spinning Rings

## Polyester and Polyester Blends



## Viscose, Viscose Blends





## Spinning Geometry

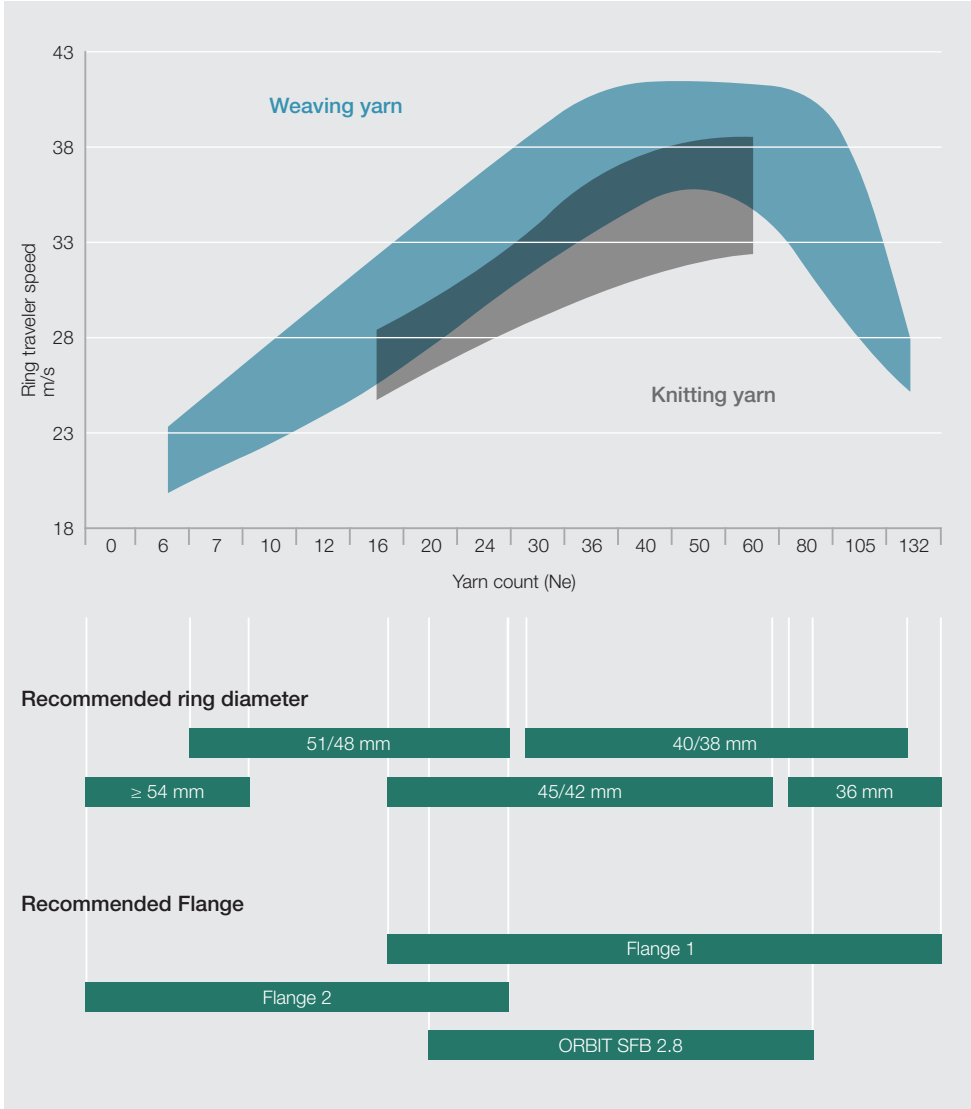
### Relationship Between Yarn Count/Ring Diameter/Flange Type/Ring Traveler Speed

The spinning geometry is determined (with the exception of sewing threads) by the yarn count:

• Coarse counts      ▶ Large ring diameter      ▶ Flange 2      ▶ Long tubes

• Fine counts      ▶ Small ring diameter      ▶ Flange 1      ▶ Short tubes

The maximum ring traveler speed is determined (with an optimal spinning geometry) by the yarn count and the twist rate.

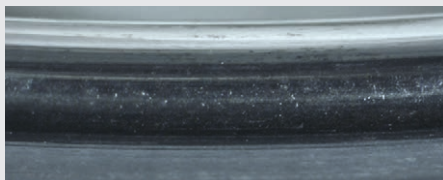


## Wear and Tear on Rings

### TITAN Rings

The high wear resistance and its consistency from ring to ring results in a ring service life of up to 10 years. The TITAN rings maintain their surface characteristics over the full ring service life.

Therefore, TITAN rings have a positive influence on performance and yarn quality.



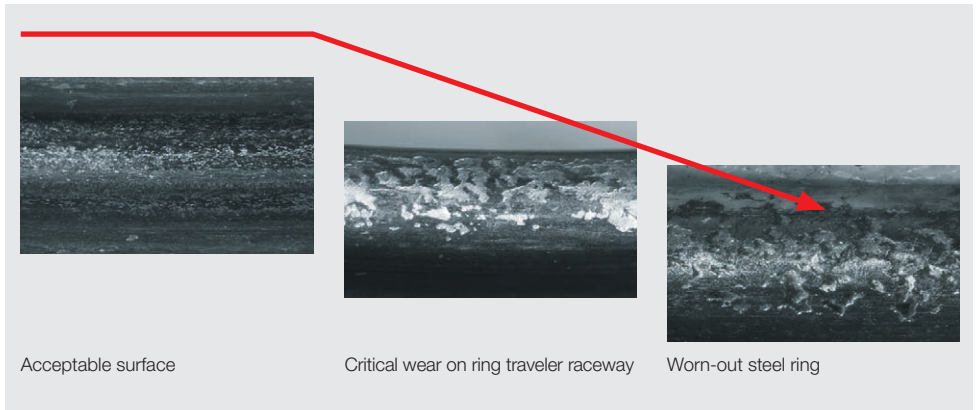
TITAN with optimal surface conditions over the entire service life

## Conventional Steel Rings

The surface of a conventional steel spinning ring is not protected against abrasion. Permanent wear and tear leads to increased roughness of the ring surface on the ring traveler raceway.

This influences the spinning tension and can have a negative impact on yarn hairiness, variation of yarn hairiness and yarn breaks.

## Steel Ring – Surface Condition Changes Due To Wear



# Spinning Performance and Yarn Quality

Ring spinning and ring twisting machine performance is essentially determined by the maximum load limit of the rings and ring travelers.

**This is the prerequisite for a good spinning result.**

Extensive research and development into rings/ring travelers has enabled the ring/ring traveler system load limit to be increased significantly.

Ring traveler wear is known to be influenced not only by the material but also by complex tribological laws. The heat generated by friction between the ring traveler and ring must be dissipated. This must happen quickly enough to avoid localized heating to temperatures above 300 degrees in the ring traveler wear zones.

The following items are necessary in order to keep the load on the ring/ring traveler system as low as possible:

- Precise centering of the ring to the spindle
- Good centering of the thread guide eyelet to the spindle
- Precise centering of the ring to the spindle
- Spindle bearing in good condition to avoid spindle vibration
- Proper ratio of the tube diameter, tube length and spindle pitch to ring diameter
- Use of balloon control rings (BE rings) with diameters matching the ring
- Use of suitable, properly adjusted ring traveler cleaners that keep the ring traveler free from flying fibers
- Favorable indoor climate (temperature and relative humidity) for the yarn being used
- Ambient air as free as possible from dust and flying fibers that would impair the ring traveler performance
- Ring support aligned exactly horizontal to the spindle

## Requirements for Optimal Results with Bräcker Rings and Ring Travelers

The spinning geometry of the spinning machines should be adapted to the yarns produced. When modifying these parameters, the following values should be considered:

It is important that the spinning rings, anti-ballooning rings and thread guides are centered toward the spindle.

This guarantees (together with optimal ring raceway and correctly selected travelers) the best yarn quality and performance.

### Thread guide

- Distance top of the tube/  
thread guide = 1.5 to 2 x tube diameter  
(ring rail position at starting position)

### Anti-ballooning ring

- Anti-ballooning ring diameter = ring diameter + 3 mm (variation between +2/+4 mm depends on the spinning geometry and machine manufacturer)
- Distance ring rail/anti-ballooning ring (ring rail position in starting position) = 2/3 of the distance ring rail/thread guide

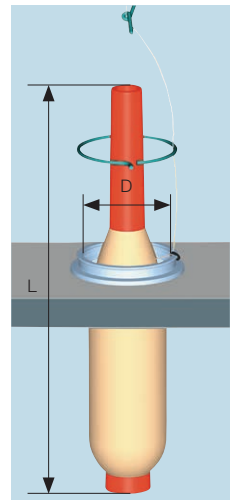
### Spinning ring

- Spinning ring diameter: max. 1/5 of the tube length; see chart below
- Horizontal, solid fixing of the rings in the ring rail
- Correct setting of the ring traveler cleaner (see pages 60–61)

### Recommended ring/tube ratio

Ring diameter (mm) D	Tube length (mm) L				Medium diameter tube (mm)				
	170	180	190	200	18	19	20	16	17
36	170	180	190	200	18	19	20	16	17
38	180	190	200	210	19	20	21	17	18
40	190	200	210	220	20	21	22	18	19
42	200	210	220	230	21	22	23	19	20
45	210	220	230	240	22	23	24	20	21
48	220	230	240	250	23	24	25	21	22
51	230	240	250	260	24	25	26	22	23
54	240	250	260	270	25	26	27	23	24

- Ideal range
- Unfavorable range



## Commissioning Procedure for New Rings (Ring Running-In)

### Ring Fixing

The rings must be fixed securely, horizontally and concentric with the spindle. Cleaning of the Bräcker rings should be avoided, as the special conservation material aids the commissioning of the rings. However, if the rings are cleaned only a dry cloth must be used (do not use any solvents).

### Running-In Procedure for THERMO 800 Rings

Conventional rings must go through a running-in program. This method ensures that the ring raceway is smoothed and passivated (oxidation) through the applied ring travelers. At the same time, the necessary lubrication film from wax, softening agents and fiber fragments is built up. Depending on the fiber being spun, the yarn counts and final speed, the spindle speed must be reduced for the first 10 to 20 ring traveler changes. It is essential that the ring running-in program is performed carefully, as this will improve the general running conditions as well as extending the ring service life.

### Commissioning Procedure for TITAN Rings

Under normal operating conditions, the TITAN coating should not be affected by the ring traveler. However, in the first phase, the ring traveler has to build-up a lubrication film on the ring and this depends on the processed fiber material and yarn count. For regular fibers, the commissioning procedure is carried out without reducing the rpm; only the first ring traveler change intervals are shortened. For compact yarns and very fine yarns (from Ne 80 and high speed) a special commissioning program must be run.

### Ring Travelers

The same ring travelers as for the regular spinning operation can be used.

### Ring Load

Excessively heavy loads must be avoided on the traveler raceway of the rings.

### Ring Traveler Wear

Avoid heavy ring traveler wear during commissioning and regular running in order to prevent premature ring wear.

### Running-In Program and Commissioning Instructions

The relevant instructions for the Bräcker ring type are delivered with each shipment. Upon request, a specially adapted program can also be provided. Please contact your local agent.

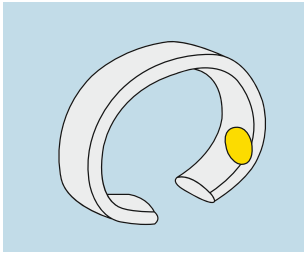
Bräcker requires the following specifications to establish a running-in program:

- Ring diameter
- Ring type, flange size
- Fiber type, yarn count, twist
- Final speed (rpm)
- Currently used ring traveler (type and weight)
- Current ring traveler service life



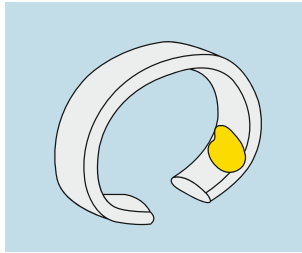
## Ring Traveler Wear with Insufficient Lubrication

In order to prevent premature ring wear, the ring traveler wear rate and ring traveler wear pattern must be checked during the running-in program and during normal operation. These two factors can be used to determine whether the ring load is within the limits and if the ring lubrication is sufficient.



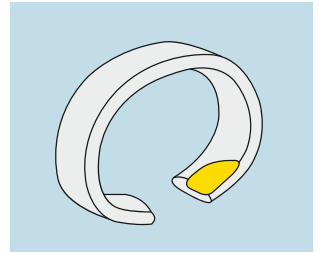
### Normal ring traveler wear

The working condition is OK.



### Excessive ring traveler wear

If more than 20 % of the ring travelers checked exhibit heavy wear, reduce the spindle speed until normal ring traveler wear is achieved.



### Abnormal ring traveler wear

If abnormal wear is detected, reduce the spindle speed. Insufficient ring lubrication results in a wear pattern as shown in the above image.

### Liability

Bräcker accepts no liability for damaged rings if the provided instructions are not followed.

This also applies to both running-in and regular operation.

## Ring Service Life

The ring service life is dependent on various factors. The correlation can be seen in the below table.

Caution: It is possible for multiple causes to be present.

TITAN rings are not very sensitive to wear and tear and generally have a very long service life. It is advisable to replace the ring when the desired yarn quality cannot be achieved any more or if there are increased yarn breaks due to damaged rings.

Factor		Ring stress		Remarks
		High	Low	
Fiber	Cotton	Dry	High wax proportion	High proportion of wax increases the lubrication
	Man-made	Dull	Bright	Dull fibers include abrasive particles (e.g. titanium oxide)
	Softening agents	Aggressive	Lubricating	Influence on lubrication
Yarn	Yarn count	Coarse	Fine	Higher load with heavier ring traveler
Ring traveler	Shape	High-bowed	Low-bowed	Improved lubrication with low-bowed ring travelers
	Service life	High ring traveler wear	Low ring traveler wear	Heavily worn ring travelers damage the ring traveler raceway
Performance	Ring traveler speed	High	Normal	Increased load at high speeds
Spinning geometry	Ring diameter	Smaller	Larger	The ring periphery of a small ring is shorter. This leads to increased stress on the running track of the ring
Machine	Centering	Poor	Good	Poorly centered rings, anti-ballooning rings and thread guides result in irregular loads
	Vibration	Strong	None, low	Inconsistent loads lead to premature wear and tear
Chlorine	Fibers	Danger		Fibers containing chlorine may also damage TITAN rings
	Ambient conditions and spinning environment	Danger		Water contaminated with chlorine must be avoided

## Yarn Breaks

### General

Alongside the yarn quality, the yarn break rate is also a limitation for the spindle speed. Reducing yarn breaks lowers spinning costs and increases productivity.

By selecting the right ring and ring traveler, the performance can be substantially influenced.

### Calculating the Yarn Break Rate

Yarn breaks/1 000 spindles/hour:

$$\frac{\text{Yarn breaks} \cdot 1\,000 \cdot 60}{\text{No. of spindles} \cdot \text{Observation time (min.)}}$$

### Influence of Speed on Yarn Breaks

Operating at higher speeds produces more yarn. As the yarn breaks are mostly counted per time unit, the latter should be considered.

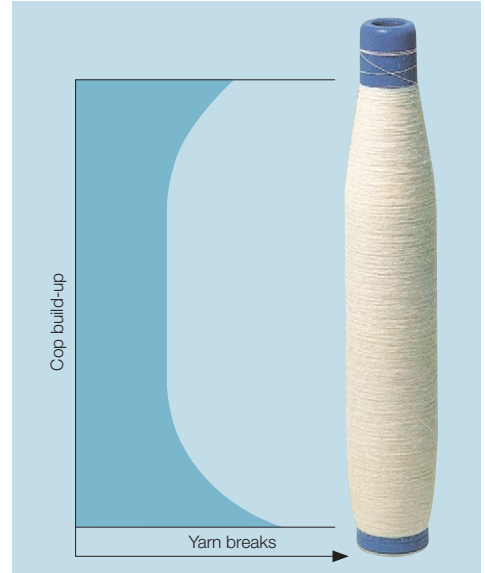
At higher speeds (with identical spinning geometry), the spinning tension is bound to be higher.

However, the yarn tenacity does not change, and the probability of yarn breaks thus increases.

Therefore, on state-of-the-art ring spinning machines the spindle rotation is adjusted accordingly (reduction on the base and top of the cop in order to avoid spinning tension peaks).

### Distribution of Yarn Breaks During

### Cop Build-Up



## Causes of Yarn Breaks During the Spinning Process

Yarn breaks can occur for a variety of reasons. A perfect ring condition and the selection of the right ring travelers are therefore extremely important.

### Breaks During the Spinning Process

Causes of yarn breaks	Corrective action
<b>Ring and ring traveler</b>	
Spinning tension too high or too low	Adjust ring traveler weight, aim for a well-balanced balloon, avoid "double" ballooning
High variation of spinning tension between spindles	Unsuitable ring traveler type, select another ring traveler type, correct centering of rings, anti-balloon rings and yarn guide eyelet
Fiber accumulation on ring travelers (fiber loading)	Adjust ring traveler cleaner (see page 29), select a ring traveler with a higher bow
Poor ring condition (worn)	Replace rings
Short ring traveler service life, ring traveler is flying off	Unsuitable ring traveler type, use ring traveler with a lower bow to improve the lubrication. Activate ring traveler running-in program after ring traveler change
Ring travelers are bent during the inserting operation (ISO 25 and finer)	Use correctly adjusted RAPID insertion tool, take care when manually inserting
<b>Drafting components</b>	
Top roller cover worn (groove formation)	Reduce grinding cycle of the top roller covers
Insufficient surface roughness (glassy surface)	Reduce grinding cycle of the top roller covers
Top roller cover too hard	Select a top roller with lower shore A hardness
Fiber wrapping tendency of the top roller covers	Surface treatment through "berkolizing"; adjust ambient conditions. Redress and clean the grinding stone to control the roughness of the top rollers
Aprons worn (groove formation, cracks on the surface)	Replace aprons
Insufficient apron roughness (glassy surface)	Replace aprons
Cradle spacer	Select the cradle spacer according to the yarn count

## Breaks During the Spinning Process

Causes of yarn breaks	Corrective action
<b>Mechanical components and settings</b>	
Ring, anti-balloon ring and yarn guide eyelet must be adjusted concentric to the spindle	Inaccurate adjustment of these elements results in unstable ring traveler running behavior, higher spinning tension and shorter service life of the ring and ring travelers. For best results, Bräcker recommends a ring-to-spindle concentricity of +/-0.2 mm
Worn-out rings, anti-balloon ring and yarn guide eyelet	Replacement
Spindles and tubes	Spindle and tube vibrations directly influence the ring traveler running behavior and the service life of ring and ring travelers, which results in tension peaks and yarn breaks
<b>Other factors</b>	
Fiber properties such as staple length, short fiber content, trash and dust content	Compromises in fiber selection can lead to increased yarn breaks. High trash and seed coat content can lead to ring traveler loading
Mass irregularity (CVm) yarn tenacity, thin places, thick places and neps	Adjust fiber preparation; higher CVm and imperfections increase the probability of a yarn break
Recommended climatic conditions for ring spinning: Cotton: Synthetic fibers:	28–32 °C, 38–48 % RH 23–28 °C, 45–54 % RH Water content: 9–12 g/kg  Water used in the air-conditioning system should have the lowest-possible mineral salt and chlorine content. These elements can lead to corrosion.

## Causes of Yarn Breaks During Doffing

Yarn breaks during commissioning may occur for various reasons. It is extremely important to first make a proper analysis of **when** and **where** the breaks occur during commissioning.

### When do yarn breaks occur during commissioning?

Causes of yarn breaks	Corrective action
<b>After under-winding</b>	
Have yarns become unthreaded from ring travelers? Check if yarn is properly tensioned; curled yarn indicates yarn is unthreaded from the ring traveler Down-winding: 1½ turns recommended	Check the spindle stop procedure
<b>After doffing, before restart</b>	
Are there broken ends? Are under-winding layers correct and firm?	Adjust the under-winding motion to create a firm yarn layer
<b>Pull-up phase (ring rail)</b>	
Does the yarn stay threaded in the ring traveler?	Reduce the pull-up stroke. The higher the stroke, the higher the possibility of unthreading due to the flat angle of the yarn to the ring traveler
<b>Start phase</b>	
Yarn breaks due to jammed ring traveler	Try a different ring traveler shape; normally a higher bow
High curling tendency of the yarn	Delay start of drafting system
Is the yarn wrapped around the snail wire? Yarn unthreaded from the ring traveler or unstable balloon formation	Balloon build-up is not stable, increase the spindle speed (steeper speed ramp). Increase the ring traveler weight. Try a different ring traveler shape; normally higher or wider bow

## Hairiness

### Yarn hairiness

Yarn hairiness is a property whereby the body of the yarn has an excessive amount of long hair protruding out of it.

Hairiness is considered to be a disturbance in the following operations:

- Fiber fluff in all stages of production
- Winding
- Sizing machine (lateral hooking)
- Warping, beam warping (dust)
- Weaving (weft bars)
- Dyeing (uneven dye absorption)

Causes of yarn hairiness	Corrective action
<b>Ring condition</b> <ul style="list-style-type: none"> <li>• Rough and uneven surfaces prevent smooth running behavior of the ring traveler</li> </ul>	<ul style="list-style-type: none"> <li>• Replace rings</li> </ul>
<b>Uneven yarn tension</b> <ul style="list-style-type: none"> <li>• Incorrect ring centering</li> <li>• Poorly centered thread guides, anti-balloon rings or damaged parts</li> <li>• Crooked tubes</li> <li>• Spindle vibrations</li> </ul>	<ul style="list-style-type: none"> <li>• Recenter all elements</li> <li>• Replace all damaged parts</li> <li>• Replace tubes</li> <li>• Replace spindles</li> </ul>
<b>Electrostatic</b> <ul style="list-style-type: none"> <li>• The fibers become electrostatically loaded</li> </ul>	<ul style="list-style-type: none"> <li>• Increase air humidity</li> </ul>
<b>Ring traveler shape</b> <ul style="list-style-type: none"> <li>• Insufficient yarn clearance</li> </ul>	<ul style="list-style-type: none"> <li>• Use a ring traveler type with a larger yarn clearance</li> </ul>
<b>Ring traveler wear</b> <ul style="list-style-type: none"> <li>• Worn ring traveler yarn passage (Viscose)</li> <li>• Worn ring travelers (ring/ring traveler contact area)</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce ring traveler running time</li> <li>• Replace ring travelers</li> </ul>
<b>Ring traveler profile</b> <ul style="list-style-type: none"> <li>• The wire profile can influence the hairiness and yarn tension</li> </ul>	<ul style="list-style-type: none"> <li>• The f profile can reduce the yarn hairiness (adjust ring traveler weight)</li> </ul>
<b>Ring traveler weight too light</b> <ul style="list-style-type: none"> <li>• Poor twist propagation on the spin triangle</li> <li>• Severe friction on the anti-balloon ring and impact on the separators</li> </ul>	<ul style="list-style-type: none"> <li>• Increase ring traveler weight or choose another type</li> </ul>
<b>Ring traveler wear too high</b> <ul style="list-style-type: none"> <li>• Excessive yarn friction leading to hairiness (neps)</li> <li>• Ring traveler weight too high, leading to ring traveler wear</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce ring traveler weight</li> </ul>

## Neps

In the context of rings and ring travelers, neps refer to production neps or push-back neps. They occur (and are measurable) only on yarns Ne 40 and finer.

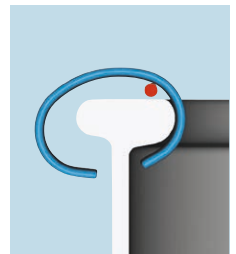
### Formation of Neps

Production neps occur mainly in the upper half of the cop. These tend to be push-back or retained fibers and occur at close gliding points and on edges as well as with excessive spinning tensions.

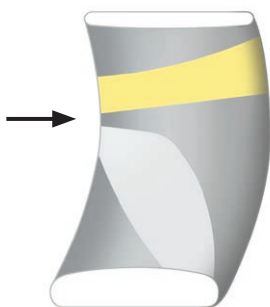
Cause	Remedy
Yarn clearance too small, yarn passage intersects with the wear and tear spot	Select a ring traveler with a higher bow
Unsuitable wire profile	Change from f to udr or from udr to dr
Spinning tension too high	Select a lighter ring traveler
Notches in thread guide	Replace



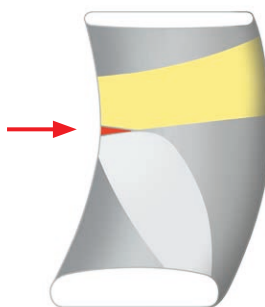
Production neps



● Yarn clearance



When the yarn passage and wear and tear area are separated:  
No risk of neps.



When the yarn passage intersects with the wear and tear area: Formation of neps possible.

■ Yarn clearance  
■ Wear and tear area



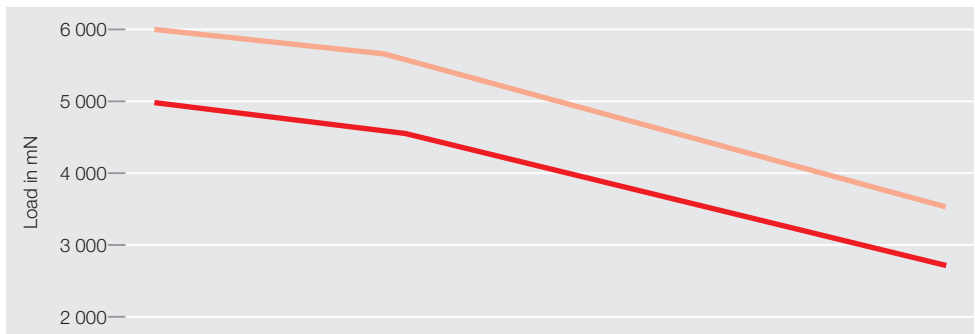
# Calculations/ Formulas

Various calculations and formulas form the basis for optimal selection of the ring and traveler system in the respective application.

## Ring Load

In order to prevent any damage on TITAN rings, the ring load indicated in the below diagram/table should not be exceeded.

**Bräcker accepts no liability for damaged rings if the recommended loads have been exceeded.**



Ring inner diameter in mm	54	51	48	45	42	40	38	36
<span style="color: red;">■</span> Cotton	5 000	4 850	4 650	4 300	4 000	3 600	3 250	2 900
<span style="color: orange;">■</span> PES/blends	6 000	5 800	5 600	5 200	4 800	4 400	4 000	3 600

Maximum ring load in mN

### Formulas

Ring load

$$L = \frac{m \cdot v^2}{r}$$

L = ring load in mN

m = ring traveler weight in mg

v = ring traveler speed in m/s

r = ring radius in mm (ring dia./2)

For ring traveler wear see page 53

For commissioning instructions

(ring running-in) see page 71

Maximum spindle speed

$$\text{rpm}_{\max} = \sqrt{\frac{L \cdot d}{m \cdot 2}} \cdot \frac{60 \cdot 1\,000}{d \cdot 3.14}$$

L = ring load in mN

m = ring traveler weight in mg

d = ring dia. in mm

**Ring Load with Different Ring Traveler Weights, Ring Diameter and rpm**

**Ring Diameter 34**

Ring traveler	No.	19/0	18/0	16/0	14/0	12/0	11/0	10/0	8/0	7/0	6/0
Ring traveler	Weight	11.2	12.5	14.0	16.0	18.0	20.0	22.4	25.0	28.0	31.5
rpm	m/s	Ring load in mN									
15 000	26	445	497	557	636	716	795	891	994	1 113	1 253
15 500	27	480	536	600	686	772	858	961	1 072	1 201	1 351
16 000	28	517	576	646	738	830	922	1 033	1 153	1 291	1 453
16 500	29	554	618	693	792	890	989	1 108	1 237	1 385	1 558
17 000	30	593	662	741	847	953	1 059	1 186	1 324	1 482	1 668
17 500	31	633	707	791	904	1 018	1 131	1 266	1 413	1 583	1 781
18 000	32	675	753	843	964	1 084	1 205	1 349	1 506	1 687	1 897
18 500	32	675	753	843	964	1 084	1 205	1 349	1 506	1 687	1 897
19 000	33	717	801	897	1 025	1 153	1 281	1 435	1 601	1 794	2 018
19 500	34	762	850	952	1 088	1 224	1 360	1 523	1 700	1 904	2 142
20 000	35	807	901	1 009	1 153	1 297	1 441	1 614	1 801	2 018	2 270
20 500	36	854	953	1 067	1 220	1 372	1 525	1 708	1 906	2 135	2 401
21 000	37	902	1 007	1 127	1 288	1 450	1 611	1 804	2 013	2 255	2 537
21 500	38	951	1 062	1 189	1 359	1 529	1 699	1 903	2 124	2 378	2 676
22 000	39	1 002	1 118	1 253	1 432	1 610	1 789	2 004	2 237	2 505	2 818
22 500	40	1 054	1 176	1 318	1 506	1 694	1 882	2 108	2 353	2 635	2 965
23 000	40	1 054	1 176	1 318	1 506	1 694	1 882	2 108	2 353	2 635	2 965
23 500	41	1 107	1 236	1 384	1 582	1 780	1 978	2 215	2 472	2 769	3 115
24 000	42	1 162	1 297	1 453	1 660	1 868	2 075	2 324	2 594	2 905	3 269
24 500	43	1 218	1 360	1 523	1 740	1 958	2 175	2 436	2 719	3 045	3 426
25 000	44	1 275	1 424	1 594	1 822	2 050	2 278	2 551	2 847	3 189	3 587
25 500	45	1 334	1 489	1 668	1 906	2 144	2 382	2 668	2 978	3 335	3 752
26 000	46	1 394	1 556	1 743	1 992	2 240	2 489	2 788	3 112	3 485	3 921
26 500	47	1 455	1 624	1 819	2 079	2 339	2 599	2 911	3 249	3 638	4 093
27 000	48	1 518	1 694	1 897	2 168	2 440	2 711	3 036	3 388	3 795	4 269
27 500	48	1 518	1 694	1 897	2 168	2 440	2 711	3 036	3 388	3 795	4 269
28 000	49	1 582	1 765	1 977	2 260	2 542	2 825	3 164	3 531	3 955	4 449
28 500	50	1 647	1 838	2 059	2 353	2 647	2 941	3 294	3 676	4 118	4 632
29 000	51	1 714	1 913	2 142	2 448	2 754	3 060	3 427	3 825	4 284	4 820
29 500	52	1 781	1 988	2 227	2 545	2 863	3 181	3 563	3 976	4 454	5 010
30 000	53	1 851	2 065	2 313	2 644	2 974	3 305	3 701	4 131	4 627	5 205

2 532	Max. CO
3 250	Max. PES and blends
3 777	Ring damage

5/0	4/0	3/0	2/0	1/0	1	2	3
35.5	40.0	45.0	50.0	56.0	63.0	71.0	80.0

1 412	1 591	1 789	1 988	2 227	2 505	2 823	3 181
1 522	1 715	1 930	2 144	2 401	2 702	3 045	3 431
1 637	1 845	2 075	2 306	2 583	2 905	3 274	3 689
1 756	1 979	2 226	2 474	2 770	3 117	3 512	3 958
1 879	2 118	2 382	2 647	2 965	3 335	3 759	4 235
2 007	2 261	2 544	2 826	3 166	3 561	4 014	4 522
2 138	2 409	2 711	3 012	3 373	3 795	4 277	4 819
2 138	2 409	2 711	3 012	3 373	3 795	4 277	4 819
2 274	2 562	2 883	3 203	3 587	4 036	4 548	5 125
2 414	2 720	3 060	3 400	3 808	4 284	4 828	5 440
2 558	2 882	3 243	3 603	4 035	4 540	5 116	5 765
2 706	3 049	3 431	3 812	4 269	4 803	5 413	6 099
2 859	3 221	3 624	4 026	4 510	5 073	5 718	6 442
3 015	3 398	3 822	4 247	4 757	5 351	6 031	6 795
3 176	3 579	4 026	4 474	5 010	5 637	6 352	7 158
3 341	3 765	4 235	4 706	5 271	5 929	6 682	7 529
3 341	3 765	4 235	4 706	5 271	5 929	6 682	7 529
3 510	3 955	4 450	4 944	5 537	6 230	7 021	7 911
3 684	4 151	4 669	5 188	5 811	6 537	7 367	8 301
3 861	4 351	4 894	5 438	6 091	6 852	7 722	8 701
4 043	4 555	5 125	5 694	6 377	7 175	8 086	9 111
4 229	4 765	5 360	5 956	6 671	7 504	8 457	9 529
4 419	4 979	5 601	6 224	6 970	7 842	8 837	9 958
4 613	5 198	5 847	6 497	7 277	8 186	9 226	10 395
4 811	5 421	6 099	6 776	7 590	8 538	9 623	10 842
4 811	5 421	6 099	6 776	7 590	8 538	9 623	10 842
5 014	5 649	6 356	7 062	7 909	8 898	10 028	11 299
5 221	5 882	6 618	7 353	8 235	9 265	10 441	11 765
5 432	6 120	6 885	7 650	8 568	9 639	10 863	12 240
5 647	6 362	7 158	7 953	8 907	10 021	11 293	12 725
5 866	6 609	7 436	8 262	9 253	10 410	11 732	13 219

## Ring Load with Different Ring Traveler Weights, Ring Diameter and rpm

### Ring Diameter 36

Ring traveler	No.	18/0	16/0	14/0	12/0	11/0	10/0	8/0	7/0	6/0	5/0
Ring traveler	Weight	12.5	14.0	16.0	18.0	20.0	22.4	25.0	28.0	31.5	35.5
rpm	m/s	Ring load in mN									
15 000	28	544	610	697	784	871	976	1 089	1 220	1 372	1 546
15 500	29	584	654	748	841	934	1 047	1 168	1 308	1 472	1 659
16 000	30	625	700	800	900	1 000	1 120	1 250	1 400	1 575	1 775
16 500	31	667	747	854	961	1 068	1 196	1 335	1 495	1 682	1 895
17 000	32	711	796	910	1 024	1 138	1 274	1 422	1 593	1 792	2 020
17 500	32	711	796	910	1 024	1 138	1 274	1 422	1 593	1 792	2 020
18 000	33	756	847	968	1 089	1 210	1 355	1 513	1 694	1 906	2 148
18 500	34	803	899	1 028	1 156	1 284	1 439	1 606	1 798	2 023	2 280
19 000	35	851	953	1 089	1 225	1 361	1 524	1 701	1 906	2 144	2 416
19 500	36	900	1 008	1 152	1 296	1 440	1 613	1 800	2 016	2 268	2 556
20 000	37	951	1 065	1 217	1 369	1 521	1 704	1 901	2 130	2 396	2 700
20 500	38	1 003	1 123	1 284	1 444	1 604	1 797	2 006	2 246	2 527	2 848
21 000	39	1 056	1 183	1 352	1 521	1 690	1 893	2 113	2 366	2 662	3 000
21 500	40	1 111	1 244	1 422	1 600	1 778	1 991	2 222	2 489	2 800	3 156
22 000	41	1 167	1 307	1 494	1 681	1 868	2 092	2 335	2 615	2 942	3 315
22 500	42	1 225	1 372	1 568	1 764	1 960	2 195	2 450	2 744	3 087	3 479
23 000	43	1 284	1 438	1 644	1 849	2 054	2 301	2 568	2 876	3 236	3 647
23 500	44	1 344	1 506	1 721	1 936	2 151	2 409	2 689	3 012	3 388	3 818
24 000	45	1 406	1 575	1 800	2 025	2 250	2 520	2 813	3 150	3 544	3 994
24 500	46	1 469	1 646	1 881	2 116	2 351	2 633	2 939	3 292	3 703	4 173
25 000	47	1 534	1 718	1 964	2 209	2 454	2 749	3 068	3 436	3 866	4 357
25 500	48	1 600	1 792	2 048	2 304	2 560	2 867	3 200	3 584	4 032	4 544
26 000	48	1 600	1 792	2 048	2 304	2 560	2 867	3 200	3 584	4 032	4 544
26 500	49	1 667	1 867	2 134	2 401	2 668	2 988	3 335	3 735	4 202	4 735
27 000	50	1 736	1 944	2 222	2 500	2 778	3 111	3 472	3 889	4 375	4 931
27 500	51	1 806	2 023	2 312	2 601	2 890	3 237	3 613	4 046	4 552	5 130
28 000	52	1 878	2 103	2 404	2 704	3 004	3 365	3 756	4 206	4 732	5 333
28 500	53	1 951	2 185	2 497	2 809	3 121	3 496	3 901	4 370	4 916	5 540
29 000	54	2 025	2 268	2 592	2 916	3 240	3 629	4 050	4 536	5 103	5 751
29 500	55	2 101	2 353	2 689	3 025	3 361	3 764	4 201	4 706	5 294	5 966
30 000	56	2 178	2 439	2 788	3 136	3 484	3 903	4 356	4 878	5 488	6 185

2 932	Max. CO
3 556	Max. PES and blends
4 000	Ring damage

4/0	3/0	2/0	1/0	1	2	3	4
40.0	45.0	50.0	56.0	63.0	71.0	80.0	90.0

1 742	1 960	2 178	2 439	2 744	3 092	3 484	3 920
1 869	2 103	2 336	2 616	2 944	3 317	3 738	4 205
2 000	2 250	2 500	2 800	3 150	3 550	4 000	4 500
2 136	2 403	2 669	2 990	3 364	3 791	4 271	4 805
2 276	2 560	2 844	3 186	3 584	4 039	4 551	5 120
2 276	2 560	2 844	3 186	3 584	4 039	4 551	5 120
2 420	2 723	3 025	3 388	3 812	4 296	4 840	5 445
2 569	2 890	3 211	3 596	4 046	4 560	5 138	5 780
2 722	3 063	3 403	3 811	4 288	4 832	5 444	6 125
2 880	3 240	3 600	4 032	4 536	5 112	5 760	6 480
3 042	3 423	3 803	4 259	4 792	5 400	6 084	6 845
3 209	3 610	4 011	4 492	5 054	5 696	6 418	7 220
3 380	3 803	4 225	4 732	5 324	6 000	6 760	7 605
3 556	4 000	4 444	4 978	5 600	6 311	7 111	8 000
3 736	4 203	4 669	5 230	5 884	6 631	7 471	8 405
3 920	4 410	4 900	5 488	6 174	6 958	7 840	8 820
4 109	4 623	5 136	5 752	6 472	7 293	8 218	9 245
4 302	4 840	5 378	6 023	6 776	7 636	8 604	9 680
4 500	5 063	5 625	6 300	7 088	7 988	9 000	10 125
4 702	5 290	5 878	6 583	7 406	8 346	9 404	10 580
4 909	5 523	6 136	6 872	7 732	8 713	9 818	11 045
5 120	5 760	6 400	7 168	8 064	9 088	10 240	11 520
5 120	5 760	6 400	7 168	8 064	9 088	10 240	11 520
5 336	6 003	6 669	7 470	8 404	9 471	10 671	12 005
5 556	6 250	6 944	7 778	8 750	9 861	11 111	12 500
5 780	6 503	7 225	8 092	9 104	10 260	11 560	13 005
6 009	6 760	7 511	8 412	9 464	10 666	12 018	13 520
6 242	7 023	7 803	8 739	9 832	11 080	12 484	14 045
6 480	7 290	8 100	9 072	10 206	11 502	12 960	14 580
6 722	7 563	8 403	9 411	10 588	11 932	13 444	15 125
6 969	7 840	8 711	9 756	10 976	12 370	13 938	14 444

## Ring Load with Different Ring Traveler Weights, Ring Diameter and rpm

## Ring Diameter 38

Ring traveler	No.	18/0	16/0	14/0	12/0	11/0	10/0	8/0	7/0	6/0	5/0
Ring traveler	Weight	12.5	14.0	16.0	18.0	20.0	22.4	25.0	28.0	31.5	35.5
rpm	m/s	Ring load in mN									
15 000	29	553	620	708	797	885	991	1 107	1 239	1 394	1 571
15 500	30	592	663	758	853	947	1 061	1 184	1 326	1 492	1 682
16 000	31	632	708	809	910	1 012	1 133	1 264	1 416	1 593	1 796
16 500	32	674	755	862	970	1 078	1 207	1 347	1 509	1 698	1 913
17 000	33	716	802	917	1 032	1 146	1 284	1 433	1 605	1 805	2 035
17 500	34	761	852	973	1 095	1 217	1 363	1 521	1 704	1 917	2 160
18 000	35	806	903	1 032	1 161	1 289	1 444	1 612	1 805	2 031	2 289
18 500	36	853	955	1 091	1 228	1 364	1 528	1 705	1 910	2 149	2 421
19 000	37	901	1 009	1 153	1 297	1 441	1 614	1 801	2 017	2 270	2 558
19 500	38	950	1 064	1 216	1 368	1 520	1 702	1 900	2 128	2 394	2 698
20 000	39	1 001	1 121	1 281	1 441	1 601	1 793	2 001	2 241	2 522	2 842
20 500	40	1 053	1 179	1 347	1 516	1 684	1 886	2 105	2 358	2 653	2 989
21 000	41	1 106	1 239	1 416	1 593	1 769	1 982	2 212	2 477	2 787	3 141
21 500	42	1 161	1 300	1 485	1 671	1 857	2 080	2 321	2 600	2 925	3 296
22 000	43	1 216	1 362	1 557	1 752	1 946	2 180	2 433	2 725	3 065	3 455
22 500	44	1 274	1 427	1 630	1 834	2 038	2 282	2 547	2 853	3 210	3 617
23 000	45	1 332	1 492	1 705	1 918	2 132	2 387	2 664	2 984	3 357	3 784
23 500	46	1 392	1 559	1 782	2 005	2 227	2 495	2 784	3 118	3 508	3 954
24 000	47	1 453	1 628	1 860	2 093	2 325	2 604	2 907	3 255	3 662	4 127
24 500	48	1 516	1 698	1 940	2 183	2 425	2 716	3 032	3 395	3 820	4 305
25 000	49	1 580	1 769	2 022	2 275	2 527	2 831	3 159	3 538	3 981	4 486
25 500	50	1 645	1 842	2 105	2 368	2 632	2 947	3 289	3 684	4 145	4 671
26 000	51	1 711	1 917	2 190	2 464	2 738	3 066	3 422	3 833	4 312	4 860
26 500	52	1 779	1 992	2 277	2 562	2 846	3 188	3 558	3 985	4 483	5 052
27 000	53	1 848	2 070	2 365	2 661	2 957	3 312	3 696	4 140	4 657	5 248
27 500	54	1 918	2 149	2 456	2 763	3 069	3 438	3 837	4 297	4 834	5 448
28 000	55	1 990	2 229	2 547	2 866	3 184	3 566	3 980	4 458	5 015	5 652
28 500	56	2 063	2 311	2 641	2 971	3 301	3 697	4 126	4 621	5 199	5 859
29 000	57	2 138	2 394	2 736	3 078	3 420	3 830	4 275	4 788	5 387	6 071
29 500	58	2 213	2 479	2 833	3 187	3 541	3 966	4 426	4 957	5 577	6 285
30 000	59	2 290	2 565	2 931	3 298	3 664	4 104	4 580	5 130	5 771	6 504

3 255

Max. CO

4 127

Max. PES and blends

4 651

Ring damage

4/0	3/0	2/0	1/0	1	2	3	4	6
40.0	45.0	50.0	56.0	63.0	71.0	80.0	90.0	100.0

1 771	1 992	2 213	2 479	2 789	3 143	3 541	3 984	4 426
1 895	2 132	2 368	2 653	2 984	3 363	3 789	4 263	4 737
2 023	2 276	2 529	2 832	3 186	3 591	4 046	4 552	5 058
2 156	2 425	2 695	3 018	3 395	3 827	4 312	4 851	5 389
2 293	2 579	2 866	3 210	3 611	4 069	4 585	5 158	5 732
2 434	2 738	3 042	3 407	3 833	4 320	4 867	5 476	6 084
2 579	2 901	3 224	3 611	4 062	4 578	5 158	5 803	6 447
2 728	3 069	3 411	3 820	4 297	4 843	5 457	6 139	6 821
2 882	3 242	3 603	4 035	4 539	5 116	5 764	6 485	7 205
3 040	3 420	3 800	4 256	4 788	5 396	6 080	6 840	7 600
3 202	3 602	4 003	4 483	5 043	5 684	6 404	7 205	8 005
3 368	3 789	4 211	4 716	5 305	5 979	6 737	7 579	8 421
3 539	3 981	4 424	4 955	5 574	6 282	7 078	7 963	8 847
3 714	4 178	4 642	5 199	5 849	6 592	7 427	8 356	9 284
3 893	4 379	4 866	5 450	6 131	6 909	7 785	8 758	9 732
4 076	4 585	5 095	5 706	6 419	7 235	8 152	9 171	10 189
4 263	4 796	5 329	5 968	6 714	7 567	8 526	9 592	10 658
4 455	5 012	5 568	6 237	7 016	7 907	8 909	10 023	11 137
4 651	5 232	5 813	6 511	7 325	8 255	9 301	10 464	11 626
4 851	5 457	6 063	6 791	7 640	8 610	9 701	10 914	12 126
5 055	5 687	6 318	7 077	7 961	8 972	10 109	11 373	12 637
5 263	5 921	6 579	7 368	8 289	9 342	10 526	11 842	13 158
5 476	6 160	6 845	7 666	8 624	9 720	10 952	12 321	13 689
5 693	6 404	7 116	7 970	8 966	10 104	11 385	12 808	14 232
5 914	6 653	7 392	8 279	9 314	10 497	11 827	13 306	14 784
6 139	6 906	7 674	8 595	9 669	10 897	12 278	13 813	15 347
6 368	7 164	7 961	8 916	10 030	11 304	12 737	14 329	15 921
6 602	7 427	8 253	9 243	10 398	11 719	13 204	14 855	16 505
6 840	7 695	8 550	9 576	10 773	12 141	13 680	15 390	17 100
7 082	7 967	8 853	9 915	11 154	12 571	14 164	15 935	17 705
7 328	8 244	9 161	10 260	11 542	13 008	14 657	16 489	18 321



**Ring Load with Different Ring Traveler Weights, Ring Diameter and rpm**

**Ring Diameter 40**

Ring traveler	No.	18/0	16/0	14/0	12/0	11/0	10/0	8/0	7/0	6/0	5/0
Ring traveler	Weight	12.5	14.0	16.0	18.0	20.0	22.4	25.0	28.0	31.5	35.5
rpm	m/s	Ring load in mN									
13 000	27	456	510	583	656	729	816	911	1 021	1 148	1 294
13 500	28	490	549	627	706	784	878	980	1 098	1 235	1 392
14 000	29	526	589	673	757	841	942	1 051	1 177	1 325	1 493
14 500	30	563	630	720	810	900	1 008	1 125	1 260	1 418	1 598
15 000	31	601	673	769	865	961	1 076	1 201	1 345	1 514	1 706
15 500	32	640	717	819	922	1 024	1 147	1 280	1 434	1 613	1 818
16 000	33	681	762	871	980	1 089	1 220	1 361	1 525	1 715	1 933
16 500	34	723	809	925	1 040	1 156	1 295	1 445	1 618	1 821	2 052
17 000	35	766	858	980	1 103	1 225	1 372	1 531	1 715	1 929	2 174
17 500	36	810	907	1 037	1 166	1 296	1 452	1 620	1 814	2 041	2 300
18 000	37	856	958	1 095	1 232	1 369	1 533	1 711	1 917	2 156	2 430
18 500	38	903	1 011	1 155	1 300	1 444	1 617	1 805	2 022	2 274	2 563
19 000	39	951	1 065	1 217	1 369	1 521	1 704	1 901	2 129	2 396	2 700
19 500	40	1 000	1 120	1 280	1 440	1 600	1 792	2 000	2 240	2 520	2 840
20 000	41	1 051	1 177	1 345	1 513	1 681	1 883	2 101	2 353	2 648	2 984
20 500	42	1 103	1 235	1 411	1 588	1 764	1 976	2 205	2 470	2 778	3 131
21 000	43	1 156	1 294	1 479	1 664	1 849	2 071	2 311	2 589	2 912	3 282
21 500	45	1 266	1 418	1 620	1 823	2 025	2 268	2 531	2 835	3 189	3 594
22 000	46	1 323	1 481	1 693	1 904	2 116	2 370	2 645	2 962	3 333	3 756
22 500	47	1 381	1 546	1 767	1 988	2 209	2 474	2 761	3 093	3 479	3 921
23 000	48	1 440	1 613	1 843	2 074	2 304	2 580	2 880	3 226	3 629	4 090
23 500	49	1 501	1 681	1 921	2 161	2 401	2 689	3 001	3 361	3 782	4 262
24 000	50	1 563	1 750	2 000	2 250	2 500	2 800	3 125	3 500	3 938	4 438
24 500	51	1 626	1 821	2 081	2 341	2 601	2 913	3 251	3 641	4 097	4 617
25 000	52	1 690	1 893	2 163	2 434	2 704	3 028	3 380	3 786	4 259	4 800
25 500	53	1 756	1 966	2 247	2 528	2 809	3 146	3 511	3 933	4 424	4 986
26 000	54	1 823	2 041	2 333	2 624	2 916	3 266	3 645	4 082	4 593	5 176
26 500	55	1 891	2 118	2 420	2 723	3 025	3 388	3 781	4 235	4 764	5 369
27 000	56	1 960	2 195	2 509	2 822	3 136	3 512	3 920	4 390	4 939	5 566
27 500	57	2 031	2 274	2 599	2 924	3 249	3 639	4 061	4 549	5 117	5 767
28 000	58	2 103	2 355	2 691	3 028	3 364	3 768	4 205	4 710	5 298	5 971
28 500	59	2 176	2 437	2 785	3 133	3 481	3 899	4 351	4 873	5 483	6 179
29 000	60	2 250	2 520	2 880	3 240	3 600	4 032	4 500	5 040	5 670	6 390
29 500	61	2 326	2 605	2 977	3 349	3 721	4 168	4 651	5 209	5 861	6 605
30 000	62	2 403	2 691	3 075	3 460	3 844	4 305	4 805	5 382	6 054	6 823

3 641	Max. CO
4 438	Max. PES and blends
4 800	Ring damage

4/0	3/0	2/0	1/0	1	2	3	4	6	7	8
40.0	45.0	50.0	56.0	63.0	71.0	80.0	90.0	100.0	112.0	125.0

1 458	1 640	1 823	2 041	2 296	2 588	2 916	3 281	3 645	4 082	4 556
1 568	1 764	1 960	2 195	2 470	2 783	3 136	3 528	3 920	4 390	4 900
1 682	1 892	2 103	2 355	2 649	2 986	3 364	3 785	4 205	4 710	5 256
1 800	2 025	2 250	2 520	2 835	3 195	3 600	4 050	4 500	5 040	5 625
1 922	2 162	2 403	2 691	3 027	3 412	3 844	4 325	4 805	5 382	6 006
2 048	2 304	2 560	2 867	3 226	3 635	4 096	4 608	5 120	5 734	6 400
2 178	2 450	2 723	3 049	3 430	3 866	4 356	4 901	5 445	6 098	6 806
2 312	2 601	2 890	3 237	3 641	4 104	4 624	5 202	5 780	6 474	7 225
2 450	2 756	3 063	3 430	3 859	4 349	4 900	5 513	6 125	6 860	7 656
2 592	2 916	3 240	3 629	4 082	4 601	5 184	5 832	6 480	7 258	8 100
2 738	3 080	3 423	3 833	4 312	4 860	5 476	6 161	6 845	7 666	8 556
2 888	3 249	3 610	4 043	4 549	5 126	5 776	6 498	7 220	8 086	9 025
3 042	3 422	3 803	4 259	4 791	5 400	6 084	6 845	7 605	8 518	9 506
3 200	3 600	4 000	4 480	5 040	5 680	6 400	7 200	8 000	8 960	10 000
3 362	3 782	4 203	4 707	5 295	5 968	6 724	7 565	8 405	9 414	10 506
3 528	3 969	4 410	4 939	5 557	6 262	7 056	7 938	8 820	9 878	11 025
3 698	4 160	4 623	5 177	5 824	6 564	7 396	8 321	9 245	10 354	11 556
4 050	4 556	5 063	5 670	6 379	7 189	8 100	9 113	10 125	11 340	12 656
4 232	4 761	5 290	5 925	6 665	7 512	8 464	9 522	10 580	11 850	13 225
4 418	4 970	5 523	6 185	6 958	7 842	8 836	9 941	11 045	12 370	13 806
4 608	5 184	5 760	6 451	7 258	8 179	9 216	10 368	11 520	12 902	14 400
4 802	5 402	6 003	6 723	7 563	8 524	9 604	10 805	12 005	13 446	15 006
5 000	5 625	6 250	7 000	7 875	8 875	10 000	11 250	12 500	14 000	15 625
5 202	5 852	6 503	7 283	8 193	9 234	10 404	11 705	13 005	14 566	16 256
5 408	6 084	6 760	7 571	8 518	9 599	10 816	12 168	13 520	15 142	16 900
5 618	6 320	7 023	7 865	8 848	9 972	11 236	12 641	14 045	15 730	17 556
5 832	6 561	7 290	8 165	9 185	10 352	11 664	13 122	14 580	16 330	18 225
6 050	6 806	7 563	8 470	9 529	10 739	12 100	13 613	15 125	16 940	18 906
6 272	7 056	7 840	8 781	9 878	11 133	12 544	14 112	15 680	17 562	19 600
6 498	7 310	8 123	9 097	10 234	11 534	12 996	14 621	16 245	18 194	20 306
6 728	7 569	8 410	9 419	10 597	11 942	13 456	15 138	16 820	18 838	21 025
6 962	7 832	8 703	9 747	10 965	12 358	13 924	15 665	17 405	19 494	21 756
7 200	8 100	9 000	10 080	11 340	12 780	14 400	16 200	18 000	20 160	22 500
7 442	8 372	9 303	10 419	11 721	13 210	14 884	16 745	18 605	20 838	23 256
7 688	8 649	9 610	10 763	12 109	13 646	15 376	17 298	19 220	21 526	24 025

## Ring Load with Different Ring Traveler Weights, Ring Diameter and rpm

## Ring Diameter 42

Ring traveler	No.	10/0	8/0	7/0	6/0	5/0	4/0	3/0	2/0	1/0	1
Ring traveler	Weight	22.4	25.0	28.0	31.5	35.5	40.0	45.0	50.0	56.0	63.0
rpm	m/s	Ring load in mN									
10 000	21	470	525	588	662	746	840	945	1 050	1 176	1 323
10 500	23	564	630	705	794	894	1 008	1 134	1 260	1 411	1 587
11 000	24	614	686	768	864	974	1 097	1 234	1 371	1 536	1 728
11 500	25	667	744	833	938	1 057	1 190	1 339	1 488	1 667	1 875
12 000	26	721	805	901	1 014	1 143	1 288	1 449	1 610	1 803	2 028
12 500	27	778	868	972	1 094	1 232	1 389	1 562	1 736	1 944	2 187
13 000	28	836	933	1 045	1 176	1 325	1 493	1 680	1 867	2 091	2 352
13 500	29	897	1 001	1 121	1 262	1 422	1 602	1 802	2 002	2 243	2 523
14 000	30	960	1 071	1 200	1 350	1 521	1 714	1 929	2 143	2 400	2 700
14 500	31	1 025	1 144	1 281	1 442	1 625	1 830	2 059	2 288	2 563	2 883
15 000	32	1 092	1 219	1 365	1 536	1 731	1 950	2 194	2 438	2 731	3 072
15 500	34	1 233	1 376	1 541	1 734	1 954	2 202	2 477	2 752	3 083	3 468
16 000	35	1 307	1 458	1 633	1 838	2 071	2 333	2 625	2 917	3 267	3 675
16 500	36	1 382	1 543	1 728	1 944	2 191	2 469	2 777	3 086	3 456	3 888
17 000	37	1 460	1 630	1 825	2 054	2 314	2 608	2 934	3 260	3 651	4 107
17 500	38	1 540	1 719	1 925	2 166	2 441	2 750	3 094	3 438	3 851	4 332
18 000	39	1 622	1 811	2 028	2 282	2 571	2 897	3 259	3 621	4 056	4 563
18 500	40	1 707	1 905	2 133	2 400	2 705	3 048	3 429	3 810	4 267	4 800
19 000	41	1 793	2 001	2 241	2 522	2 842	3 202	3 602	4 002	4 483	5 043
19 500	42	1 882	2 100	2 352	2 646	2 982	3 360	3 780	4 200	4 704	5 292
20 000	43	1 972	2 201	2 465	2 774	3 126	3 522	3 962	4 402	4 931	5 547
20 500	45	2 160	2 411	2 700	3 038	3 423	3 857	4 339	4 821	5 400	6 075
21 000	46	2 257	2 519	2 821	3 174	3 577	4 030	4 534	5 038	5 643	6 348
21 500	47	2 356	2 630	2 945	3 314	3 734	4 208	4 734	5 260	5 891	6 627
22 000	48	2 458	2 743	3 072	3 456	3 895	4 389	4 937	5 486	6 144	6 912
22 500	49	2 561	2 858	3 201	3 602	4 059	4 573	5 145	5 717	6 403	7 203
23 000	50	2 667	2 976	3 333	3 750	4 226	4 762	5 357	5 952	6 667	7 500
23 500	51	2 774	3 096	3 468	3 902	4 397	4 954	5 574	6 193	6 936	7 803
24 000	52	2 884	3 219	3 605	4 056	4 571	5 150	5 794	6 438	7 211	8 112
24 500	53	2 996	3 344	3 745	4 214	4 749	5 350	6 019	6 688	7 491	8 427
25 000	54	3 110	3 471	3 888	4 374	4 929	5 554	6 249	6 943	7 776	8 748

4 059

Max. CO

4 937

Max. PES and blends

5 145

Ring damage

2	3	4	6	7	8	9	10	11	12	13
71.0	80.0	90.0	100.0	112.0	125.0	140.0	160.0	180.0	200.0	224.0

1 491	1 680	1 890	2 100	2 352	2 625	2 940	3 360	3 780	4 200	4 704
1 789	2 015	2 267	2 519	2 821	3 149	3 527	4 030	4 534	5 038	5 643
1 947	2 194	2 469	2 743	3 072	3 429	3 840	4 389	4 937	5 486	6 144
2 113	2 381	2 679	2 976	3 333	3 720	4 167	4 762	5 357	5 952	6 667
2 286	2 575	2 897	3 219	3 605	4 024	4 507	5 150	5 794	6 438	7 211
2 465	2 777	3 124	3 471	3 888	4 339	4 860	5 554	6 249	6 943	7 776
2 651	2 987	3 360	3 733	4 181	4 667	5 227	5 973	6 720	7 467	8 363
2 843	3 204	3 604	4 005	4 485	5 006	5 607	6 408	7 209	8 010	8 971
3 043	3 429	3 857	4 286	4 800	5 357	6 000	6 857	7 714	8 571	9 600
3 249	3 661	4 119	4 576	5 125	5 720	6 407	7 322	8 237	9 152	10 251
3 462	3 901	4 389	4 876	5 461	6 095	6 827	7 802	8 777	9 752	10 923
3 908	4 404	4 954	5 505	6 165	6 881	7 707	8 808	9 909	11 010	12 331
4 142	4 667	5 250	5 833	6 533	7 292	8 167	9 333	10 500	11 667	13 067
4 382	4 937	5 554	6 171	6 912	7 714	8 640	9 874	11 109	12 343	13 824
4 629	5 215	5 867	6 519	7 301	8 149	9 127	10 430	11 734	13 038	14 603
4 882	5 501	6 189	6 876	7 701	8 595	9 627	11 002	12 377	13 752	15 403
5 142	5 794	6 519	7 243	8 112	9 054	10 140	11 589	13 037	14 486	16 224
5 410	6 095	6 857	7 619	8 533	9 524	10 667	12 190	13 714	15 238	17 067
5 683	6 404	7 204	8 005	8 965	10 006	11 207	12 808	14 409	16 010	17 931
5 964	6 720	7 560	8 400	9 408	10 500	11 760	13 440	15 120	16 800	18 816
6 251	7 044	7 924	8 805	9 861	11 006	12 327	14 088	15 849	17 610	19 723
6 846	7 714	8 679	9 643	10 800	12 054	13 500	15 429	17 357	19 286	21 600
7 154	8 061	9 069	10 076	11 285	12 595	14 107	16 122	18 137	20 152	22 571
7 469	8 415	9 467	10 519	11 781	13 149	14 727	16 830	18 934	21 038	23 563
7 790	8 777	9 874	10 971	12 288	13 714	15 360	17 554	19 749	21 943	24 576
8 118	9 147	10 290	11 433	12 805	14 292	16 007	18 293	20 580	22 867	25 611
8 452	9 524	10 714	11 905	13 333	14 881	16 667	19 048	21 429	23 810	26 667
8 794	9 909	11 147	12 386	13 872	15 482	17 340	19 817	22 294	24 771	27 744
9 142	10 301	11 589	12 876	14 421	16 095	18 027	20 602	23 177	25 752	28 843
9 497	10 701	12 039	13 376	14 981	16 720	18 727	21 402	24 077	26 752	29 963
9 859	11 109	12 497	13 886	15 552	17 357	19 440	22 217	24 994	27 771	31 104

## Ring Load with Different Ring Traveler Weights, Ring Diameter and rpm

### Ring Diameter 45

Ring traveler	No.	6/0	5/0	4/0	3/0	2/0	1/0	1	2	3	4
Ring traveler	Weight	31.5	35.5	40.0	45.0	50.0	56.0	63.0	71.0	80.0	90.0
rpm	m/s	Ring load in mN									
8 000	18	454	511	576	648	720	806	907	1 022	1 152	1 296
8 500	20	560	631	711	800	889	996	1 120	1 262	1 422	1 600
9 000	21	617	696	784	882	980	1 098	1 235	1 392	1 568	1 764
9 500	22	678	764	860	968	1 076	1 205	1 355	1 527	1 721	1 936
10 000	23	741	835	940	1 058	1 176	1 317	1 481	1 669	1 881	2 116
10 500	24	806	909	1 024	1 152	1 280	1 434	1 613	1 818	2 048	2 304
11 000	25	875	986	1 111	1 250	1 389	1 556	1 750	1 972	2 222	2 500
11 500	27	1 021	1 150	1 296	1 458	1 620	1 814	2 041	2 300	2 592	2 916
12 000	28	1 098	1 237	1 394	1 568	1 742	1 951	2 195	2 474	2 788	3 136
12 500	29	1 177	1 327	1 495	1 682	1 869	2 093	2 355	2 654	2 990	3 364
13 000	30	1 260	1 420	1 600	1 800	2 000	2 240	2 520	2 840	3 200	3 600
13 500	31	1 345	1 516	1 708	1 922	2 136	2 392	2 691	3 032	3 417	3 844
14 000	32	1 434	1 616	1 820	2 048	2 276	2 549	2 867	3 231	3 641	4 096
14 500	34	1 618	1 824	2 055	2 312	2 569	2 877	3 237	3 648	4 110	4 624
15 000	35	1 715	1 933	2 178	2 450	2 722	3 049	3 430	3 866	4 356	4 900
15 500	36	1 814	2 045	2 304	2 592	2 880	3 226	3 629	4 090	4 608	5 184
16 000	37	1 917	2 160	2 434	2 738	3 042	3 407	3 833	4 320	4 868	5 476
16 500	38	2 022	2 278	2 567	2 888	3 209	3 594	4 043	4 557	5 134	5 776
17 000	40	2 240	2 524	2 844	3 200	3 556	3 982	4 480	5 049	5 689	6 400
17 500	41	2 353	2 652	2 988	3 362	3 736	4 184	4 707	5 304	5 977	6 724
18 000	42	2 470	2 783	3 136	3 528	3 920	4 390	4 939	5 566	6 272	7 056
18 500	43	2 589	2 917	3 287	3 698	4 109	4 602	5 177	5 835	6 574	7 396
19 000	44	2 710	3 055	3 442	3 872	4 302	4 818	5 421	6 109	6 884	7 744
19 500	45	2 835	3 195	3 600	4 050	4 500	5 040	5 670	6 390	7 200	8 100
20 000	47	3 093	3 485	3 927	4 418	4 909	5 498	6 185	6 971	7 854	8 836
20 500	48	3 226	3 635	4 096	4 608	5 120	5 734	6 451	7 270	8 192	9 216
21 000	49	3 361	3 788	4 268	4 802	5 336	5 976	6 723	7 576	8 537	9 604
21 500	50	3 500	3 944	4 444	5 000	5 556	6 222	7 000	7 889	8 889	10 000

4 418

Max. CO

5 498

Max. PES and blends

6 185

Ring damage

6	7	8	9	10	11	12	13	14	16	18	20	24
100.0	112.0	125.0	140.0	160.0	180.0	200.0	224.0	250.0	280.0	315.0	355.0	400.0

1 440	1 613	1 800	2 016	2 304	2 592	2 880	3 226	3 600	4 032	4 536	5 112	5 760
1 778	1 991	2 222	2 489	2 844	3 200	3 556	3 982	4 444	4 978	5 600	6 311	7 111
1 960	2 195	2 450	2 744	3 136	3 528	3 920	4 390	4 900	5 488	6 174	6 958	7 840
2 151	2 409	2 689	3 012	3 442	3 872	4 302	4 818	5 378	6 023	6 776	7 636	8 604
2 351	2 633	2 939	3 292	3 762	4 232	4 702	5 266	5 878	6 583	7 406	8 346	9 404
2 560	2 867	3 200	3 584	4 096	4 608	5 120	5 734	6 400	7 168	8 064	9 088	10 240
2 778	3 111	3 472	3 889	4 444	5 000	5 556	6 222	6 944	7 778	8 750	9 861	11 111
3 240	3 629	4 050	4 536	5 184	5 832	6 480	7 258	8 100	9 072	10 206	11 502	12 960
3 484	3 903	4 356	4 878	5 575	6 272	6 969	7 805	8 711	9 756	10 976	12 370	13 938
3 738	4 186	4 672	5 233	5 980	6 728	7 476	8 373	9 344	10 466	11 774	13 269	14 951
4 000	4 480	5 000	5 600	6 400	7 200	8 000	8 960	10 000	11 200	12 600	14 200	16 000
4 271	4 784	5 339	5 980	6 834	7 688	8 542	9 567	10 678	11 959	13 454	15 162	17 084
4 551	5 097	5 689	6 372	7 282	8 192	9 102	10 194	11 378	12 743	14 336	16 156	18 204
5 138	5 754	6 422	7 193	8 220	9 248	10 276	11 509	12 844	14 386	16 184	18 239	20 551
5 444	6 098	6 806	7 622	8 711	9 800	10 889	12 196	13 611	15 244	17 150	19 328	21 778
5 760	6 451	7 200	8 064	9 216	10 368	11 520	12 902	14 400	16 128	18 144	20 448	23 040
6 084	6 815	7 606	8 518	9 735	10 952	12 169	13 629	15 211	17 036	19 166	21 600	24 338
6 418	7 188	8 022	8 985	10 268	11 552	12 836	14 376	16 044	17 970	20 216	22 783	25 671
7 111	7 964	8 889	9 956	11 378	12 800	14 222	15 929	17 778	19 911	22 400	25 244	28 444
7 471	8 368	9 339	10 460	11 954	13 448	14 942	16 735	18 678	20 919	23 534	26 522	29 884
7 840	8 781	9 800	10 976	12 544	14 112	15 680	17 562	19 600	21 952	24 696	27 832	31 360
8 218	9 204	10 272	11 505	13 148	14 792	16 436	18 408	20 544	23 010	25 886	29 173	32 871
8 604	9 637	10 756	12 046	13 767	15 488	17 209	19 274	21 511	24 092	27 104	30 546	34 418
9 000	10 080	11 250	12 600	14 400	16 200	18 000	20 160	22 500	25 200	28 350	31 950	36 000
9 818	10 996	12 272	13 745	15 708	17 672	19 636	21 992	24 544	27 490	30 926	34 853	39 271
10 240	11 469	12 800	14 336	16 384	18 432	20 480	22 938	25 600	28 672	32 256	36 352	40 960
10 671	11 952	13 339	14 940	17 074	19 208	21 342	23 903	26 678	29 879	33 614	37 882	42 684
11 111	12 444	13 889	15 556	17 778	20 000	22 222	24 889	27 778	31 111	35 000	39 444	44 444

## Ring Load with Different Ring Traveler Weights, Ring Diameter and rpm

### Ring Diameter 48

Ring traveler	No.	5/0	4/0	3/0	2/0	1/0	1	2	3	4	6
Ring traveler	Weight	35.5	40.0	45.0	50.0	56.0	63.0	71.0	80.0	90.0	100.0
rpm	m/s	Ring load in mN									
6 500	16	379	427	480	533	597	672	757	853	960	1 067
7 000	17	427	482	542	602	674	759	855	963	1 084	1 204
7 500	18	479	540	608	675	756	851	959	1 080	1 215	1 350
8 000	20	592	667	750	833	933	1 050	1 183	1 333	1 500	1 667
8 500	21	652	735	827	919	1 029	1 158	1 305	1 470	1 654	1 838
9 000	22	716	807	908	1 008	1 129	1 271	1 432	1 613	1 815	2 017
9 500	23	782	882	992	1 102	1 234	1 389	1 565	1 763	1 984	2 204
10 000	25	924	1 042	1 172	1 302	1 458	1 641	1 849	2 083	2 344	2 604
10 500	26	1 000	1 127	1 268	1 408	1 577	1 775	2 000	2 253	2 535	2 817
11 000	27	1 078	1 215	1 367	1 519	1 701	1 914	2 157	2 430	2 734	3 038
11 500	28	1 160	1 307	1 470	1 633	1 829	2 058	2 319	2 613	2 940	3 267
12 000	30	1 331	1 500	1 688	1 875	2 100	2 363	2 663	3 000	3 375	3 750
12 500	31	1 421	1 602	1 802	2 002	2 242	2 523	2 843	3 203	3 604	4 004
13 000	32	1 515	1 707	1 920	2 133	2 389	2 688	3 029	3 413	3 840	4 267
13 500	33	1 611	1 815	2 042	2 269	2 541	2 859	3 222	3 630	4 084	4 538
14 000	35	1 812	2 042	2 297	2 552	2 858	3 216	3 624	4 083	4 594	5 104
14 500	36	1 917	2 160	2 430	2 700	3 024	3 402	3 834	4 320	4 860	5 400
15 000	37	2 025	2 282	2 567	2 852	3 194	3 594	4 050	4 563	5 134	5 704
15 500	38	2 136	2 407	2 708	3 008	3 369	3 791	4 272	4 813	5 415	6 017
16 000	40	2 367	2 667	3 000	3 333	3 733	4 200	4 733	5 333	6 000	6 667
16 500	41	2 486	2 802	3 152	3 502	3 922	4 413	4 973	5 603	6 304	7 004
17 000	42	2 609	2 940	3 308	3 675	4 116	4 631	5 219	5 880	6 615	7 350
17 500	43	2 735	3 082	3 467	3 852	4 314	4 854	5 470	6 163	6 934	7 704
18 000	45	2 995	3 375	3 797	4 219	4 725	5 316	5 991	6 750	7 594	8 438
18 500	46	3 130	3 527	3 968	4 408	4 937	5 555	6 260	7 053	7 935	8 817
19 000	47	3 267	3 682	4 142	4 602	5 154	5 799	6 535	7 363	8 284	9 204
19 500	48	3 408	3 840	4 320	4 800	5 376	6 048	6 816	7 680	8 640	9 600
20 000	50	3 698	4 167	4 688	5 208	5 833	6 563	7 396	8 333	9 375	10 417

4 725

Max. CO

5 991

Max. PES and blends

6 750

Ring damage

7	8	9	10	11	12	13	14	16	18	20	24
112.0	125.0	140.0	160.0	180.0	200.0	224.0	250.0	280.0	315.0	355.0	400.0

1 195	1 333	1 493	1 707	1 920	2 133	2 389	2 667	2 987	3 360	3 787	4 267
1 349	1 505	1 686	1 927	2 168	2 408	2 697	3 010	3 372	3 793	4 275	4 817
1 512	1 688	1 890	2 160	2 430	2 700	3 024	3 375	3 780	4 253	4 793	5 400
1 867	2 083	2 333	2 667	3 000	3 333	3 733	4 167	4 667	5 250	5 917	6 667
2 058	2 297	2 573	2 940	3 308	3 675	4 116	4 594	5 145	5 788	6 523	7 350
2 259	2 521	2 823	3 227	3 630	4 033	4 517	5 042	5 647	6 353	7 159	8 067
2 469	2 755	3 086	3 527	3 968	4 408	4 937	5 510	6 172	6 943	7 825	8 817
2 917	3 255	3 646	4 167	4 688	5 208	5 833	6 510	7 292	8 203	9 245	10 417
3 155	3 521	3 943	4 507	5 070	5 633	6 309	7 042	7 887	8 873	9 999	11 267
3 402	3 797	4 253	4 860	5 468	6 075	6 804	7 594	8 505	9 568	10 783	12 150
3 659	4 083	4 573	5 227	5 880	6 533	7 317	8 167	9 147	10 290	11 597	13 067
4 200	4 688	5 250	6 000	6 750	7 500	8 400	9 375	10 500	11 813	13 313	15 000
4 485	5 005	5 606	6 407	7 208	8 008	8 969	10 010	11 212	12 613	14 215	16 017
4 779	5 333	5 973	6 827	7 680	8 533	9 557	10 667	11 947	13 440	15 147	17 067
5 082	5 672	6 353	7 260	8 168	9 075	10 164	11 344	12 705	14 293	16 108	18 150
5 717	6 380	7 146	8 167	9 188	10 208	11 433	12 760	14 292	16 078	18 120	20 417
6 048	6 750	7 560	8 640	9 720	10 800	12 096	13 500	15 120	17 010	19 170	21 600
6 389	7 130	7 986	9 127	10 268	11 408	12 777	14 260	15 972	17 968	20 250	22 817
6 739	7 521	8 423	9 627	10 830	12 033	13 477	15 042	16 847	18 953	21 359	24 067
7 467	8 333	9 333	10 667	12 000	13 333	14 933	16 667	18 667	21 000	23 667	26 667
7 845	8 755	9 806	11 207	12 608	14 008	15 689	17 510	19 612	22 063	24 865	28 017
8 232	9 188	10 290	11 760	13 230	14 700	16 464	18 375	20 580	23 153	26 093	29 400
8 629	9 630	10 786	12 327	13 868	15 408	17 257	19 260	21 572	24 268	27 350	30 817
9 450	10 547	11 813	13 500	15 188	16 875	18 900	21 094	23 625	26 578	29 953	33 750
9 875	11 021	12 343	14 107	15 870	17 633	19 749	22 042	24 687	27 773	31 299	35 267
10 309	11 505	12 886	14 727	16 568	18 408	20 617	23 010	25 772	28 993	32 675	36 817
10 752	12 000	13 440	15 360	17 280	19 200	21 504	24 000	26 880	30 240	34 080	38 400
11 667	13 021	14 583	16 667	18 750	20 833	23 333	26 042	29 167	32 813	36 979	41 667



## Ring Load with Different Ring Traveler Weights, Ring Diameter and rpm

## Ring Diameter 51

Ring traveler	No.	5/0	4/0	3/0	2/0	1/0	1	2	3	4	6
Ring traveler	Weight	35.5	40.0	45.0	50.0	56.0	63.0	71.0	80.0	90.0	100.0
rpm	m/s	Ring load in mN									
5 000	13	235	265	298	331	371	418	471	530	596	663
5 500	14	273	307	346	384	430	484	546	615	692	769
6 000	16	356	402	452	502	562	632	713	803	904	1 004
6 500	17	402	453	510	567	635	714	805	907	1 020	1 133
7 000	18	451	508	572	635	712	800	902	1 016	1 144	1 271
7 500	20	557	627	706	784	878	988	1 114	1 255	1 412	1 569
8 000	21	614	692	778	865	968	1 090	1 228	1 384	1 556	1 729
8 500	22	674	759	854	949	1 063	1 196	1 348	1 518	1 708	1 898
9 000	24	802	904	1 016	1 129	1 265	1 423	1 604	1 807	2 033	2 259
9 500	25	870	980	1 103	1 225	1 373	1 544	1 740	1 961	2 206	2 451
10 000	26	941	1 060	1 193	1 325	1 485	1 670	1 882	2 121	2 386	2 651
10 500	28	1 091	1 230	1 384	1 537	1 722	1 937	2 183	2 460	2 767	3 075
11 000	29	1 171	1 319	1 484	1 649	1 847	2 078	2 342	2 638	2 968	3 298
11 500	30	1 253	1 412	1 588	1 765	1 976	2 224	2 506	2 824	3 176	3 529
12 000	32	1 426	1 606	1 807	2 008	2 249	2 530	2 851	3 213	3 614	4 016
12 500	33	1 516	1 708	1 922	2 135	2 392	2 690	3 032	3 416	3 844	4 271
13 000	34	1 609	1 813	2 040	2 267	2 539	2 856	3 219	3 627	4 080	4 533
13 500	36	1 804	2 033	2 287	2 541	2 846	3 202	3 608	4 066	4 574	5 082
14 000	37	1 906	2 147	2 416	2 684	3 006	3 382	3 812	4 295	4 832	5 369
14 500	38	2 010	2 265	2 548	2 831	3 171	3 568	4 021	4 530	5 096	5 663
15 000	40	2 227	2 510	2 824	3 137	3 514	3 953	4 455	5 020	5 647	6 275
15 500	41	2 340	2 637	2 966	3 296	3 692	4 153	4 680	5 274	5 933	6 592
16 000	42	2 456	2 767	3 113	3 459	3 874	4 358	4 912	5 534	6 226	6 918
16 500	44	2 695	3 037	3 416	3 796	4 252	4 783	5 390	6 074	6 833	7 592
17 000	45	2 819	3 176	3 574	3 971	4 447	5 003	5 638	6 353	7 147	7 941
17 500	46	2 946	3 319	3 734	4 149	4 647	5 228	5 892	6 638	7 468	8 298
18 000	48	3 208	3 614	4 066	4 518	5 060	5 692	6 415	7 228	8 132	9 035
18 500	49	3 343	3 766	4 237	4 708	5 273	5 932	6 685	7 533	8 474	9 416
19 000	50	3 480	3 922	4 412	4 902	5 490	6 176	6 961	7 843	8 824	9 804
19 500	52	3 764	4 242	4 772	5 302	5 938	6 680	7 529	8 483	9 544	10 604
20 000	53	3 911	4 406	4 957	5 508	6 169	6 940	7 821	8 813	9 914	11 016

5 020

Max. CO

6 030

Max. PES and blends

6 425

Ring damage

7	8	9	10	11	12	13	14	16	18	20	24
112.0	125.0	140.0	160.0	180.0	200.0	224.0	250.0	280.0	315.0	355.0	400.0

742	828	928	1 060	1 193	1 325	1 485	1 657	1 856	2 088	2 353	2 651
861	961	1 076	1 230	1 384	1 537	1 722	1 922	2 152	2 421	2 729	3 075
1 124	1 255	1 405	1 606	1 807	2 008	2 249	2 510	2 811	3 162	3 564	4 016
1 269	1 417	1 587	1 813	2 040	2 267	2 539	2 833	3 173	3 570	4 023	4 533
1 423	1 588	1 779	2 033	2 287	2 541	2 846	3 176	3 558	4 002	4 511	5 082
1 757	1 961	2 196	2 510	2 824	3 137	3 514	3 922	4 392	4 941	5 569	6 275
1 937	2 162	2 421	2 767	3 113	3 459	3 874	4 324	4 842	5 448	6 139	6 918
2 126	2 373	2 657	3 037	3 416	3 796	4 252	4 745	5 315	5 979	6 738	7 592
2 530	2 824	3 162	3 614	4 066	4 518	5 060	5 647	6 325	7 115	8 019	9 035
2 745	3 064	3 431	3 922	4 412	4 902	5 490	6 127	6 863	7 721	8 701	9 804
2 969	3 314	3 711	4 242	4 772	5 302	5 938	6 627	7 423	8 351	9 411	10 604
3 443	3 843	4 304	4 919	5 534	6 149	6 887	7 686	8 609	9 685	10 915	12 298
3 694	4 123	4 617	5 277	5 936	6 596	7 388	8 245	9 235	10 389	11 708	13 192
3 953	4 412	4 941	5 647	6 353	7 059	7 906	8 824	9 882	11 118	12 529	14 118
4 498	5 020	5 622	6 425	7 228	8 031	8 995	10 039	11 244	12 649	14 256	16 063
4 783	5 338	5 979	6 833	7 687	8 541	9 566	10 676	11 958	13 452	15 161	17 082
5 077	5 667	6 347	7 253	8 160	9 067	10 155	11 333	12 693	14 280	16 093	18 133
5 692	6 353	7 115	8 132	9 148	10 165	11 384	12 706	14 231	16 009	18 042	20 329
6 013	6 711	7 516	8 590	9 664	10 737	12 026	13 422	15 032	16 911	19 059	21 475
6 342	7 078	7 928	9 060	10 193	11 325	12 685	14 157	15 856	17 838	20 103	22 651
7 027	7 843	8 784	10 039	11 294	12 549	14 055	15 686	17 569	19 765	22 275	25 098
7 383	8 240	9 229	10 547	11 866	13 184	14 766	16 480	18 458	20 765	23 402	26 369
7 748	8 647	9 685	11 068	12 452	13 835	15 496	17 294	19 369	21 791	24 558	27 671
8 503	9 490	10 629	12 147	13 666	15 184	17 006	18 980	21 258	23 915	26 952	30 369
8 894	9 926	11 118	12 706	14 294	15 882	17 788	19 853	22 235	25 015	28 191	31 765
9 294	10 373	11 617	13 277	14 936	16 596	18 588	20 745	23 235	26 139	29 458	33 192
10 120	11 294	12 649	14 456	16 264	18 071	20 239	22 588	25 299	28 461	32 075	36 141
10 546	11 770	13 182	15 065	16 948	18 831	21 091	23 539	26 364	29 659	33 426	37 663
10 980	12 255	13 725	15 686	17 647	19 608	21 961	24 510	27 451	30 882	34 804	39 216
11 876	13 255	14 845	16 966	19 087	21 208	23 753	26 510	29 691	33 402	37 644	42 416
12 338	13 770	15 422	17 625	19 828	22 031	24 675	27 539	30 844	34 699	39 106	44 063

## Ring Load with Different Ring Traveler Weights, Ring Diameter and rpm

### Ring Diameter 54

Ring traveler	No.	2/0	1/0	1	2	3	4	6	7	8	9
Ring traveler	Weight	50.0	56.0	63.0	71.0	80.0	90.0	100.0	112.0	125.0	140.0
rpm	m/s	Ring load in mN									
5 000	14	363	407	457	515	581	653	726	813	907	1 016
5 500	15	417	467	525	592	667	750	833	933	1 042	1 167
6 000	16	474	531	597	673	759	853	948	1 062	1 185	1 327
6 500	18	600	672	756	852	960	1 080	1 200	1 344	1 500	1 680
7 000	19	669	749	842	949	1 070	1 203	1 337	1 497	1 671	1 872
7 500	21	817	915	1 029	1 160	1 307	1 470	1 633	1 829	2 042	2 287
8 000	22	896	1 004	1 129	1 273	1 434	1 613	1 793	2 008	2 241	2 510
8 500	24	1 067	1 195	1 344	1 515	1 707	1 920	2 133	2 389	2 667	2 987
9 000	25	1 157	1 296	1 458	1 644	1 852	2 083	2 315	2 593	2 894	3 241
9 500	26	1 252	1 402	1 577	1 778	2 003	2 253	2 504	2 804	3 130	3 505
10 000	28	1 452	1 626	1 829	2 062	2 323	2 613	2 904	3 252	3 630	4 065
10 500	29	1 557	1 744	1 962	2 212	2 492	2 803	3 115	3 489	3 894	4 361
11 000	31	1 780	1 993	2 242	2 527	2 847	3 203	3 559	3 986	4 449	4 983
11 500	32	1 896	2 124	2 389	2 693	3 034	3 413	3 793	4 248	4 741	5 310
12 000	33	2 017	2 259	2 541	2 864	3 227	3 630	4 033	4 517	5 042	5 647
12 500	35	2 269	2 541	2 858	3 221	3 630	4 083	4 537	5 081	5 671	6 352
13 000	36	2 400	2 688	3 024	3 408	3 840	4 320	4 800	5 376	6 000	6 720
13 500	38	2 674	2 995	3 369	3 797	4 279	4 813	5 348	5 990	6 685	7 487
14 000	39	2 817	3 155	3 549	4 000	4 507	5 070	5 633	6 309	7 042	7 887
14 500	40	2 963	3 319	3 733	4 207	4 741	5 333	5 926	6 637	7 407	8 296
15 000	42	3 267	3 659	4 116	4 639	5 227	5 880	6 533	7 317	8 167	9 147
15 500	43	3 424	3 835	4 314	4 862	5 479	6 163	6 848	7 670	8 560	9 587
16 000	45	3 750	4 200	4 725	5 325	6 000	6 750	7 500	8 400	9 375	10 500
16 500	46	3 919	4 389	4 937	5 564	6 270	7 053	7 837	8 777	9 796	10 972
17 000	48	4 267	4 779	5 376	6 059	6 827	7 680	8 533	9 557	10 667	11 947
17 500	49	4 446	4 980	5 602	6 314	7 114	8 003	8 893	9 960	11 116	12 450

5 333

Max. CO

6 407

Max. PES and blends

7 119

Ring damage

10	11	12	13	14	16	18	20	24
160.0	180.0	200.0	224.0	250.0	280.0	315.0	355.0	400.0

1 161	1 307	1 452	1 626	1 815	2 033	2 287	2 577	2 904
1 333	1 500	1 667	1 867	2 083	2 333	2 625	2 958	3 333
1 517	1 707	1 896	2 124	2 370	2 655	2 987	3 366	3 793
1 920	2 160	2 400	2 688	3 000	3 360	3 780	4 260	4 800
2 139	2 407	2 674	2 995	3 343	3 744	4 212	4 746	5 348
2 613	2 940	3 267	3 659	4 083	4 573	5 145	5 798	6 533
2 868	3 227	3 585	4 015	4 481	5 019	5 647	6 364	7 170
3 413	3 840	4 267	4 779	5 333	5 973	6 720	7 573	8 533
3 704	4 167	4 630	5 185	5 787	6 481	7 292	8 218	9 259
4 006	4 507	5 007	5 608	6 259	7 010	7 887	8 888	10 015
4 646	5 227	5 807	6 504	7 259	8 130	9 147	10 308	11 615
4 984	5 607	6 230	6 977	7 787	8 721	9 812	11 058	12 459
5 695	6 407	7 119	7 973	8 898	9 966	11 212	12 635	14 237
6 068	6 827	7 585	8 495	9 481	10 619	11 947	13 464	15 170
6 453	7 260	8 067	9 035	10 083	11 293	12 705	14 318	16 133
7 259	8 167	9 074	10 163	11 343	12 704	14 292	16 106	18 148
7 680	8 640	9 600	10 752	12 000	13 440	15 120	17 040	19 200
8 557	9 627	10 696	11 980	13 370	14 975	16 847	18 986	21 393
9 013	10 140	11 267	12 619	14 083	15 773	17 745	19 998	22 533
9 481	10 667	11 852	13 274	14 815	16 593	18 667	21 037	23 704
10 453	11 760	13 067	14 635	16 333	18 293	20 580	23 193	26 133
10 957	12 327	13 696	15 340	17 120	19 175	21 572	24 311	27 393
12 000	13 500	15 000	16 800	18 750	21 000	23 625	26 625	30 000
12 539	14 107	15 674	17 555	19 593	21 944	24 687	27 821	31 348
13 653	15 360	17 067	19 115	21 333	23 893	26 880	30 293	34 133
14 228	16 007	17 785	19 919	22 231	24 899	28 012	31 569	35 570

## Technical Data for Spinning

### Numbering Systems for Yarns and Twists

#### Yarn Count Comparison Chart (Rounded Figures)

tex	den	Nm	Ne <sub>c</sub>
100.0	900	10.0	6.0
84.0	750	12.0	7.0
72.0	643	14.0	8.3
64.0	563	16.0	9.5
60.0	529	17.0	10.0
56.0	500	18.0	10.6
50.0	450	20.0	12.0
46.0	409	22.0	13.0
42.0	375	24.0	14.0
36.0	321	28.0	16.5
34.0	300	30.0	18.0
32.0	281	32.0	19.0
30.0	265	34.0	20.0
25.0	225	40.0	24.0
23.0	205	44.0	26.0
21.0	188	48.0	28.0
20.0	180	50.0	30.0
17.0	150	60.0	36.0
14.0	129	70.0	40.0
12.5	113	80.0	48.0
12.0	108	85.0	50.0
10.0	90	100.0	60.0
8.3	75	120.0	70.0
7.4	67	135.0	80.0
6.6	60	150.0	90.0
5.8	52	170.0	100.0
5.5	50	180.0	105.0
5.0	45	200.0	120.0
4.0	36	250.0	150.0
3.3	30	300.0	180.0

**Conversion Formulas**

Desired Given	Abbrevia- tion	tex	dtex	den	Nm	Ne <sub>c</sub>
Tex	tex	-	10 tex	9 tex	$\frac{1\,000}{\text{tex}}$	$\frac{590}{\text{tex}}$
Decitex	dtex	0.1 dtex	-	0.9 tex	$\frac{10\,000}{\text{dtex}}$	$\frac{5\,900}{\text{dtex}}$
Denier	den	0.111 den	1.111 den	-	$\frac{9\,000}{\text{den}}$	$\frac{5\,315}{\text{den}}$
Metric no.	Nm	$\frac{1\,000}{\text{Nm}}$	$\frac{10\,000}{\text{Nm}}$	$\frac{9\,000}{\text{Nm}}$	-	0.590 Nm
Engl. cotton no.	Ne <sub>c</sub>	$\frac{590}{\text{Ne}_c}$	$\frac{5\,900}{\text{Ne}_c}$	$\frac{5\,315}{\text{Ne}_c}$	1.693 Ne <sub>c</sub>	-

**Twist**

$$\text{with Ne } T'' = \alpha e \cdot \sqrt{\text{Ne}}$$

$$\text{with Nm } T/m = \alpha m \cdot \sqrt{\text{Nm}}$$

$$\text{with tex } T/m = \frac{\alpha \text{tex}}{\sqrt{\text{tex}}}$$

**Conversion Formula – Twist**

$$T'' = T/m \cdot 0.0254$$

$$\alpha m = \alpha e \cdot 30.3$$

**Twist Multiplier**

$$\text{with Ne } \alpha e = \frac{T''}{\sqrt{\text{Ne}}}$$

$$\text{with Nm } \alpha m = \frac{T/m}{\sqrt{\text{Nm}}}$$

$$\text{with tex } \alpha \text{tex} = T/m \cdot \sqrt{\text{tex}}$$

$$T/m = T'' \cdot 39.4$$

$$\alpha e = \alpha m \cdot 0.033$$

$$\text{tex} = \frac{\text{g}}{1000 \text{ m}}$$

$$\text{den} = \frac{\text{g}}{9000 \text{ m}}$$

$$\text{Nm} = \frac{\text{m}}{1 \text{ g}}$$

$$\text{Ne}_c = \frac{840 \text{ yds}}{\text{pound}}$$

## Formulas for Calculating Ring Traveler Speed Performance

### Ring Traveler Speeds in m/s (Rounded Figures), Ring Diameter 36–70 mm

Formula: 
$$\frac{\text{ring diameter} \cdot \pi \cdot n \text{ (rpm)}}{1\,000 \cdot 60} = \text{m/s}$$

Ring dia. (mm)	Ring traveler speed (m/sec)																																
	28	29	31	33	34	36	37	39	40	42	44	45																					
60																																	
57																																	
54																																	
51																																	
48																																	
45																																	
42																																	
40																																	
38																																	
36																																	
	9 000	9 500	10 000	10 500	11 000	11 500	12 000	12 500	13 000	13 500	14 000	14 500	15 000	15 500	16 000	16 500	17 000	17 500	18 000	18 500	19 000	19 500	20 000	20 500	21 000	21 500	22 000	22 500	23 000	23 500	24 000	24 500	25 000
	Spindle speed n/min (rpm)																																

### Performance Calculations

Delivery:

$$L = \frac{n}{T/m} = \text{m/min}$$

Production:

$$P_{pr} = \frac{L \cdot \text{tex} \cdot 60}{1\,000} \cdot \lambda = \text{g/h}$$

or

$$P_{pr} = \frac{n \cdot \text{tex} \cdot 60}{T/m \times 1\,000} \cdot \lambda = \text{g/h}$$

L = Delivery in m/min

P<sub>pr</sub> = Production in practice

n = Spindle speed in rpm

T/m = Twists per m

g/h = Gram/hour (spindle)

λ = Efficiency

**Ring traveler weight (short formula)**

Fine yarn:	tex · 2.6 = ISO no.
Coarse yarn:	tex · 2.8 = ISO no.
MMF:	tex · 3.0 = ISO no.

Calculating the optimal ring traveler weight

tex	= Yarn count (g/km)
ISO no.	= Ring traveler weight in mg or in grams per 1 000 ring travelers

**Grishin Formula**

Applicable to all yarns and ring/sleeve ratios

**Formula for optimal ring traveler weight**

$$\text{ISO} = \frac{H^2}{R\emptyset \cdot \text{Nm}} \cdot K$$

H	= Sleeve length in cm
R ∅	= Spinning ring diameter in cm
Nm	= Yarn count (1.69 · Ne)
K	= Factor 25 at Ne (Nm) 3–5 (5–8) 24 at Ne (Nm) 6–10 (10–17) 20 at Ne (Nm) 12–40 (20–68) 22 at Ne (Nm) 42–50 (70–85)

**Formula for Spinning Limit**

$$n_{\text{fibers}}/\emptyset = \frac{Tt_z [\text{tex}]}{Tt_{\text{fibers}} [\text{tex}]}$$

or:

$$n_{\text{fibers}}/\emptyset = \frac{Tt_z [\text{tex}] \times 25.4}{Tt_{\text{fibers}} [\mu\text{g}/\text{inch}]}$$

tex	= Fineness
$n_{\text{fibers}}/\emptyset$	= Fibers in cross section, number
$Tt_z$	= Fineness
$Tt_{\text{fibers}}$	= Fiber fineness
$\mu\text{g}/\text{inch}$	= Micronaire

**Formula for Fiber Fineness**

$$\text{Fineness} = \frac{\text{Micronaire } [\mu\text{g}/\text{inch}] \times 39.37}{1\,000}$$

tex	= Fineness
$\mu\text{g}/\text{inch}$	= Micronaire



**Formula for Yarn Tears/1 000 Spindle Hours**

$$n_{\text{FdB}/1\ 000\text{Sph}} = \frac{n_{\text{FdB}} \times 1\ 000_{\text{Spindles}} \times 60(\text{min}) \cdot n}{n_{\text{Spindles}} \times t}$$

- $n_{\text{FdB}/1\ 000\text{Sph}}$  = Formula for yarn tears/1 000 spindle hours
- $n_{\text{FdB}}$  = Number of yarn tears
- $n_{\text{Spindles}}$  = Number of spindles
- $t$  = Pick-up time in minutes

**Formula for Twist Coefficient**

from to	atex	am	ae
atex	-	31.6 * am	957*ae
am	atex/31.6	-	
ae	atex/957	am/30.7	-

**Formula for Twist**

$T/''$	$ae \times \sqrt{Ne}$
$T/m$	$am \times \sqrt{Nm}$
$T/m$	$atex/\sqrt{tex}$
$T/m$	$T/'' \times 39.4$
$T/''$	$T/m \times 0.0254$

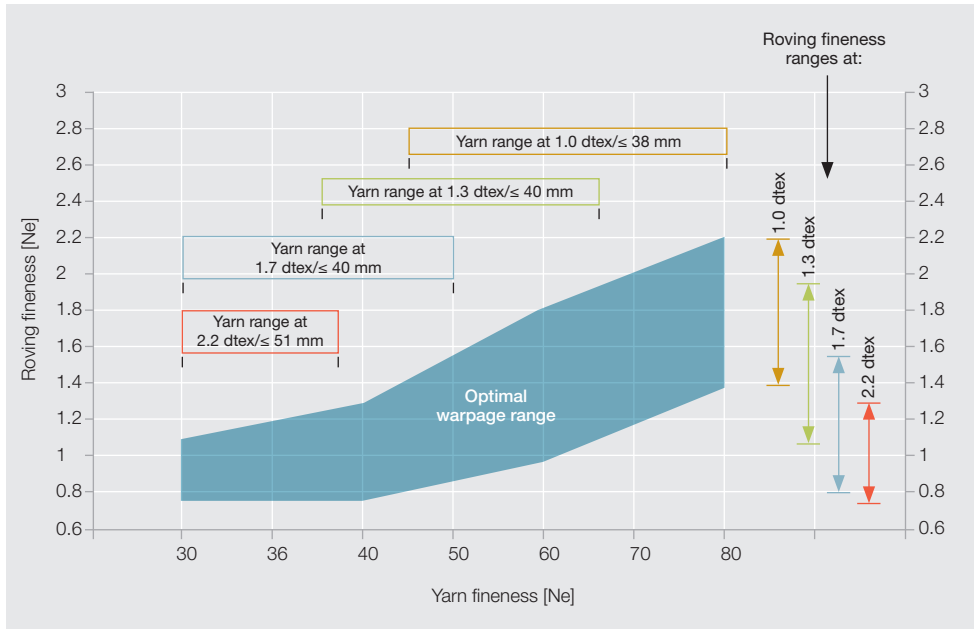


# Additional Information

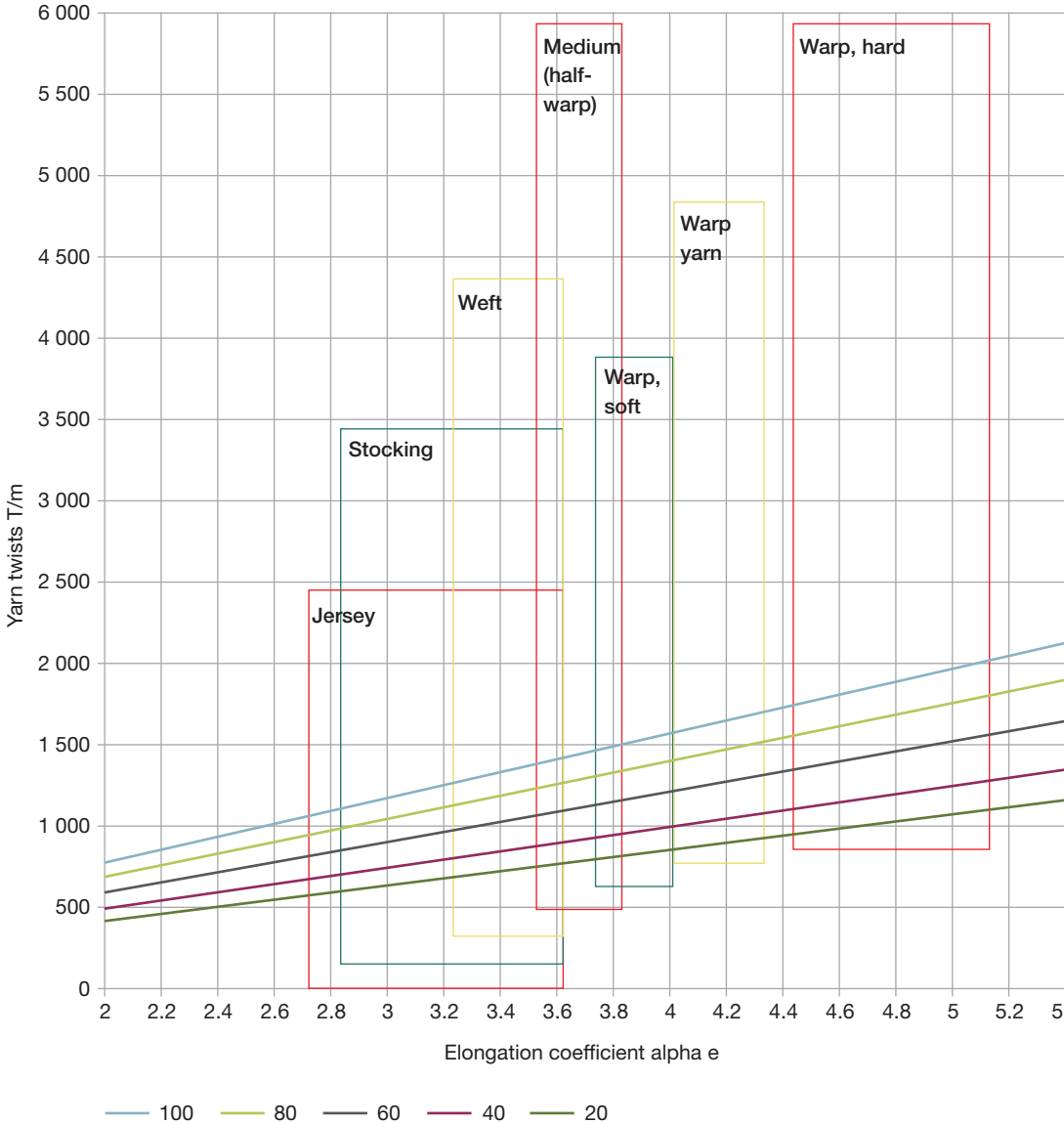
Information on dependencies and conditions of the fiber and yarn properties is vital when choosing the machine and device.

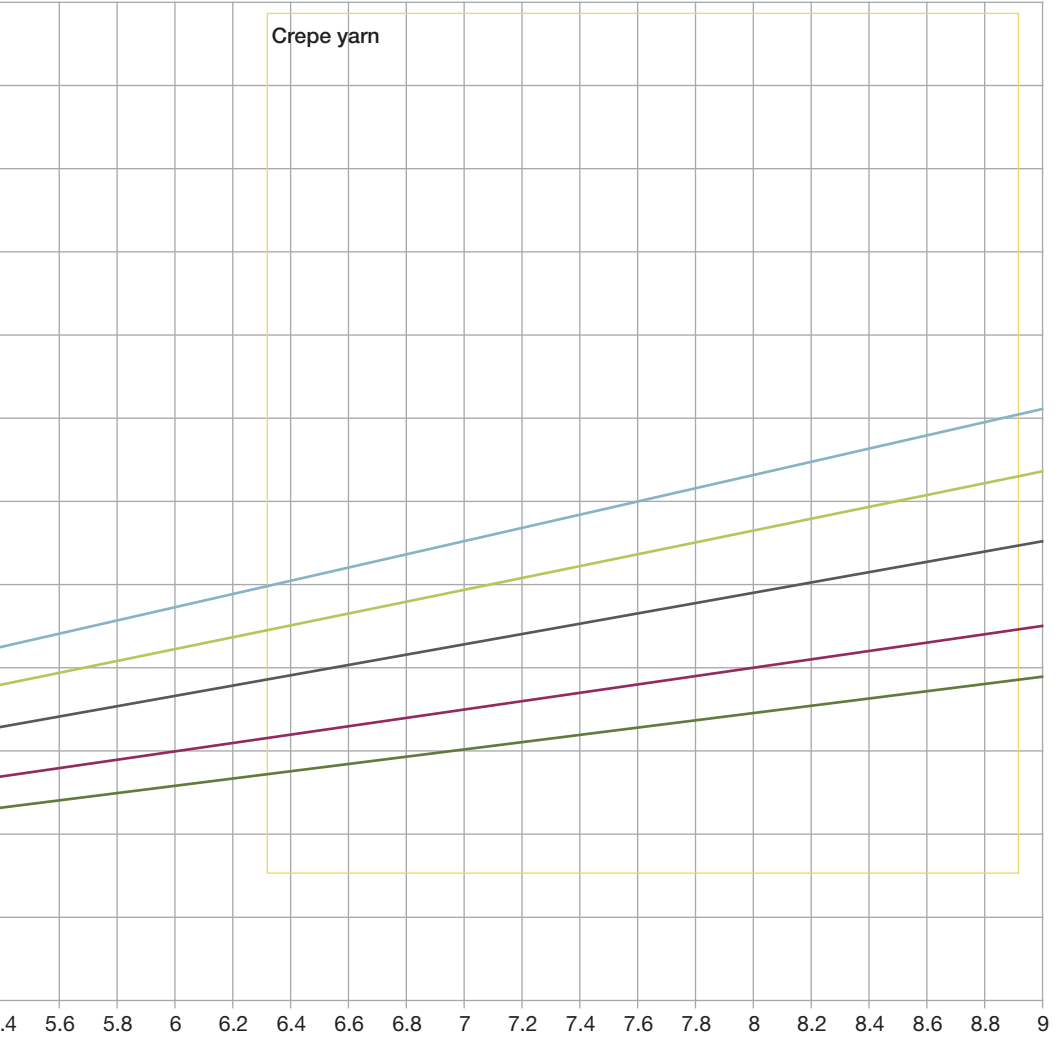
## Spinning Limits with Chemical Fibers

### Spinning Limits with Chemical Fibers (According to Fiber, Roving and Yarn Fineness)

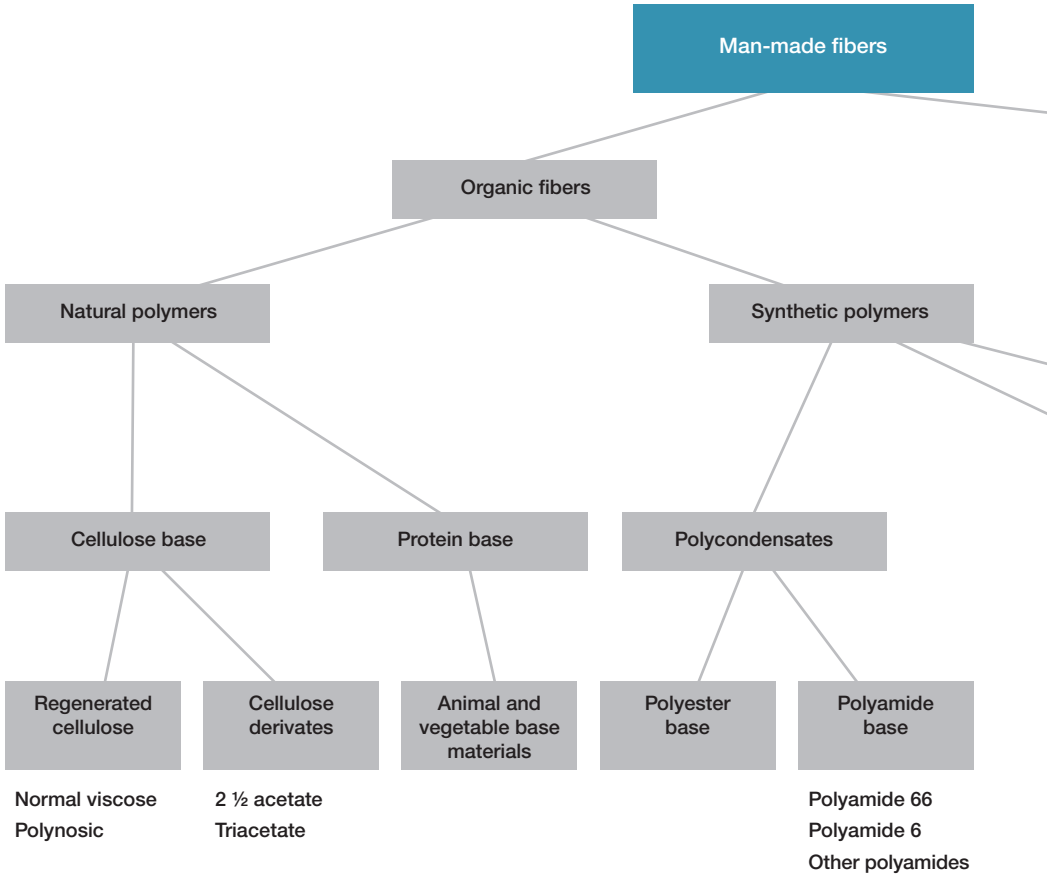


## Yarn Twist and Elongation Coefficient

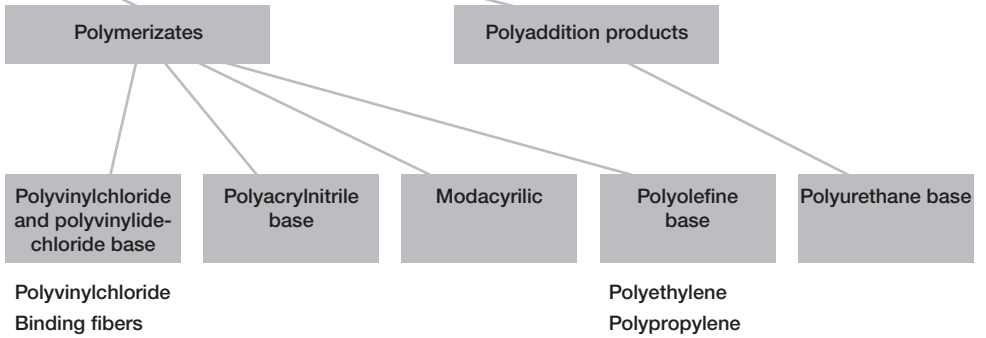
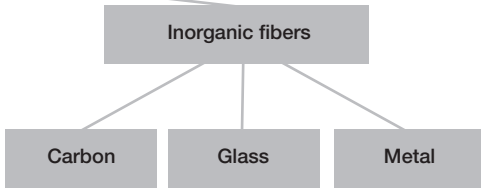




## Man-Made Fiber Types



The above table does not claim to be complete.





# Tools

The Bräcker product assortment includes various types of insertion, cleaning and cutting tools for the spinning industry.

**ROLSPRINT – Fluff Remover**

ROLSPRINT fluff removers are very efficient tools for cleaning textile machines with hardened steel gears and special smooth-running ball bearings. Exchangeable tip.

Standard spindle lengths:  
315 mm and 400 mm



**Bräcker SECUTEX and CUTEX cutting tools are suitable for use in various areas of a spinning mill**

**SECUTEX – Cutting**

- Safety cutter with blade protection
- Exchangeable steel blade

**CUTEX – Cutting**

- Tuft cutter with (exchangeable) brass blade
- Standard lengths: 50 mm and 100 mm

**CLIX – Insertion and Removal**

- For inserting (loose) and removing the following ring travelers:
- For C-shaped, ORBIT and SU ring travelers

**OUTY – Removal**

- For removing C-shaped ring travelers and ORBIT ring travelers
- Removed ring travelers are collected in the handle



## Insertion Tools for Magazined Ring Travelers

### **Bräcker RAPID for C-Shaped, SFB and SU Ring Travelers**

Bräcker RAPID insertion tools enable rapid and efficient replacement of ring travelers in spinning mills.

#### **Properties**

- Insertion tool for magazined ring travelers
- Simple setting with ring traveler as a gauge
- Enables yarn to be threaded in the ring traveler during insertion
- Especially well suited to small gauges or applications with a ring data system installed
- The fastest way to insert ring travelers

#### **Application**

The Bräcker RAPID offers following advantages:

- Tool for inserting magazined, C-shaped, ORBIT and SU ring travelers
- Suitable for the smallest ring diameters and minimal spindle gauges
- Easy access even with installed ring traveler monitoring systems

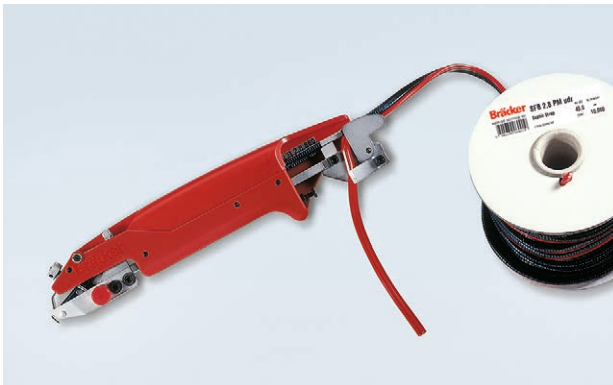
#### **Advantages for Spinning Mills**

The Bräcker RAPID offers following advantages:

- Enables rapid and efficient replacement of ring travelers in spinning mills
- Fast and easy insertion of ring travelers
- Simple setting with ring traveler as a gauge
- Lower labor costs
- Reduced ring traveler losses
- Insertion and threading processes can be combined
- Higher productivity
- Easy to use



RAPID AP



RAPID STRAP

## RAPID Insertion Tools – Range of Application

Profile 2)	Traveler shape	No. Range 1)		Tool No.		Storing bar
		BAG nr.	ISO	Rapid 400	SAP No.	Profile 679.252.xx
C-shape dr, udr	L 1	20/0 - 10	10 - 160	679.401/402*	220967 / 220968*	.01 / 220952
	M 1, EM 1	20/0 - 10	10 - 160	679.408	220970	.03 / 220953
	C 1 UL	20/0 - 10	10 - 160	679.419/420*	220972 / 220973	.01 / 220952
	C 1 SL	20/0 - 10	10 - 160	679.433/434*	220980 / 220981*	.01 / 220952
	C1 SEL	20/0 - 10	10 - 160	679.431/432*	220978 / 220979*	.09 / 220956
	C 1 UM	20/0 - 10	10 - 160	679.424/425*	220974 / 220975*	.07 / 220955
	C 1 LM	20/0 - 10	10 - 160	679.405	220969	.07 / 220955
	C 1 MM	12/0 - 1/0	18 - 56	679.427	220976	.01 / 220952
		1 - 12	63 - 200	679.428	220977	.03 / 220953
	EL 1, C 1 EL, C 1 ELM	20/0 - 10	10 - 160	679.441/442*	220984 / 220985*	.05 / 220954
	C 1 SKL	20/0 - 10	10 - 160	679.435/436*	220982 / 220983*	.13 / 220957
	C 1 HW	20/0 - 10	10 - 160	679.646	220994	220959
	M 2, EM 2	20/0 - 10	10 - 160	679.602/603*	220986 / 220987*	.51 / 220958
	H 2, EH 2	20/0 - 10	10 - 160	679.617	220989	.53 / 220959
	C 2 UM	20/0 - 10	10 - 160	679.611	220988	.55 / 220960
	C 2 MM	11/0 - 6	20 - 100	679.620	220990	.51 / 220958
		7 - 10	112 - 160	679.623	220991	.53 / 220959
	C 2 HW	6 - 10	100 - 160	679.646	220994	.53 / 220959
	C 2	6/0 - 6	31.5 - 100	679.637	220993	.73 / 220961
		7 - 20	112 - 160	679.636	220992	.75 / 220962

Profile 2)	Traveler shape	No. Range 1)		Tool No.		Storing bar
		BAG nr.	ISO	Rapid 400	SAP No.	Profile 679.252.xx
All	SU-BM, -BF	All	31.5 - 280	679.851	220996	679.257 / 220966
	SU-B	All	31.5 - 280	679.850	220995	679.254 / 220963
All	SU-B	All	31.5 - 280	679.851	220996	679.257 / 220966
All	SFB 2.8 PM, RL	All	All	679.862/863*	220997 / 220998*	679.256 / 220965

AP

STRAP

\* Fine version: for ring travelers 8/0 (ISO 25) and lighter

1) For heavy travelers (above no. 10-14 (ISO160-250), use Bräcker BOY.

Available in AP/Strap according to our delivery program

2) For r profile with C-shaped ring travelers, use Bräcker BOY



## Bräcker BOY for C-Shaped Ring Travelers

The Bräcker BOY is ideal for very heavy and/or very lightweight ring travelers.

Type	Flange	Inserting ring travelers
C8	1 (3.2 mm)	From outside to inside
C9	2 (4.0 mm)	
C71	1 (3.2 mm)	From inside to outside
C72	2 (4.0 mm)	(for ring diameter $\geq$ 48 mm)



Recommended mainly for heavy ring travelers  
(> No. 10, ISO 160)

Exception:

Light travelers L1 f and C1 EL udr.

## Range of Application

Ring type	Ring traveler type	Ring traveler range		Storing bar/ profile no.	BOY type
		ISO	Bräcker		
Flange 1	C1 HW dr	160–280	10–16	H2/EH2	C8/C71
	C1 MM udr	160–200	10–12	M1/EM1	
	EM1 dr	160–315	10–18		
	L1 f	7.1–16	26/0–14/0	L1 f	
	C1 EL udr	5.6–16	29/0–14/0	EL1	
Flange 2	C2 MM	160–315	10–18	H2/EH2	C9/C72
	C2 HW	160–425	10–26		
	H2 f	160–250	10–14		
	H2 dr				
	H2 fr	160–200	10–12		
	EH2 dr	160–560	10–36		

Ring traveler types not listed here should be inserted using the Bräcker RAPID insertion tool.

See page 116–117

## Magazing System

### Bräcker AP (automatic packing)

- Magazing system for C-shaped ring travelers
- Flexible system for easy handling
- Ring traveler designation (type and no.) on AP rod (to avoid mix-ups)



AP rod to be used with Bräcker RAPID and Bräcker BOY

### Bräcker STRAP

- The ring traveler is taken up on a profile STRAP at up to 10 000 per spool
- STRAP system for:
  - ORBIT ring travelers
  - SU ring travelers



Profile STRAP to be used with Bräcker RAPID only



## STROBOSCOPE

The Bräcker STROBOSCOPE can be used in spinning mills to analyze both the ring traveler position and the ring traveler condition to choose the right ring traveler shape and perform replacements before yarn breaks occur.

### Properties

- High-power LEDs with focusing optics
- High, focused brightness up to 3 800 lux (at 20 cm)
- Flash frequency up to 2 000 Hz/99 999 rpm
- Can be operated using batteries or rechargeable batteries
- Flash sequence can be controlled internally or externally
- Observation point can be moved to suit the application
- Adjustable flash duration for pin-sharp images
- Frequency divider and multiplier
- Quick and easy memory function for four flash frequencies
- Secure adhesion of the aluminum tube on the top roller

### Advantages

- Compact and lightweight
- Facilitates selecting the optimal ring traveler for the application (visible yarn/ring traveler/ring distances)
- Ring traveler behavior can be controlled during production
- Flash sequence can be easily adjusted
- Clear, back-lit frequency display



## Ring Centering Device

Ring centering is a very effective method to significantly improve the spinning geometry at the spinning position. It reduces both the hairiness of the yarn and the tension fluctuations in the ring traveler system. The Bräcker ring centering device is ideal for centering the ring with extreme precision.

### Application

- For centering rings on ring spinning machines
- Battery-powered – No mains current required and thus no cables
- Works directly on the spindle, with no special adapter required
- Designed for spindle diameters from 16 mm to 18 mm
- Suitable for ring diameters from 36 mm to 54 mm
- Centering accuracy  $\pm 0.15$  mm
- Spring-loaded chuck jaws prevent play on the ring, irrespective of ring tolerances
- The open design means the device can be slipped over the spindle from the side, so it is not obstructed by yarn guides or balloon controls
- The ring traveler can remain on the ring for centering

### Operation

- Several inductive sensors distributed around the ring periphery measure the distance to the spindle
- Microcontroller-operated LED display shows the adjustment direction and the center point.
- Interchangeable ring adapters mean the device can be used on different ring diameters and shapes



# BERKOL Cots and Aprons

BERKOL cots are technical components that have a direct influence on yarn quality and the overall performance of a spinning mill. BERKOL cots minimize lap formation and yarn breaks while improving yarn quality.

## BERKOL Cots

### Raw Material

Compounds with a shore A hardness in the range of 63 to 83 are used as raw materials for coating. The composition of the raw material determines the characteristics of the cover, such as:

- Hardness
- Elasticity
- Grip
- Abrasion resistance
- Notch tensile strength
- Swelling resistance
- Color

These characteristics should meet the following requirements for top roller covers:

- Good fiber guiding
- No lap formation
- Long service life
- Good resistance to aging
- Minimal film formation



## Selecting the Top Roller Cover

The demands placed on top roller covers have increased significantly in recent years. Continually higher quality requirements and faster processing speeds make it increasingly important to choose the correct covers with regard to lap formation, service life, swelling, aging and static charge.

The quality of the rubber covers to be selected should be determined not only under consideration of the above characteristics, but also based on the machine type, ambient conditions, yarn type and quality. This is why it is so important to follow recommendations by the cover manufacturer.

High-quality BERKOL cots enable a variety of raw materials to be processed in short staple spinning under all ambient conditions. BERKOL cots are a key component in the spinning process as they determine the yarn quality and the performance level for the overall efficiency of a spinning mill. The combination of BERKOL cots and proven BERKOL aprons allows Bräcker customers to achieve optimal levels of productivity and benefit from BERKOL's valuable experience as a leader in rubber technology.

## Application

BERKOL cots are suitable for all short staple spinning processes, as well as roving frames and spinning preparation processes such as drawing and combing. They are available in all common dimensions and meet OEM requirements.

## Advantages

- Outstanding running behavior
- Consistent yarn quality
- Excellent fiber guidance
- Reduced lap formation and yarn breaks
- High efficiency due to less machine downtime
- Long service life
- Optimal grinding behavior

Spinning mills all over the world are being improved by BERKOL's comprehensive solutions. BERKOL's high standards of quality can be achieved by combining the rubber cots with state-of-the-art maintenance solutions. Optimal grinding results can be achieved with BERKOL grinding and maintenance machines, which extend the service life by efficiently reducing maintenance costs.

## Reference Table for BERKOL Cots

	Designation	Color	Shore A hardness
	BERKOL 63	Petrol	63
	BERKOL 65 S	Brown	65
	BERKOL 65	Red	66
	BERKOL 70	Blue	70
	BERKOL 74	Green	76
	BERKOL 83	Olive	83
	BERKOL 75	Black	80

### Cot Recommendations

The optimal product is determined based on:

Spinning methods	Count range [Ne]	Cotton 100%	CO/PES 70/30 %	CO/PES 50/50 %	PES 100%	CV 100%	Tencel Modal Lyocell
Ring spinning Compact Non-compact	8–16	BERKOL 74	BERKOL 83	BERKOL 83	BERKOL 83	BERKOL 83	BERKOL 74
	12–24	BERKOL 70	BERKOL 70	BERKOL 83	BERKOL 83	BERKOL 83	BERKOL 74
	20–35	BERKOL 65	BERKOL 70	BERKOL 70	BERKOL 83	BERKOL 74	BERKOL 74
	30–70	BERKOL 65	BERKOL 65	BERKOL 70	BERKOL 70	BERKOL 74	BERKOL 70
	> 60	BERKOL 63	BERKOL 65	BERKOL 70	BERKOL 70	BERKOL 74	BERKOL 70
Air-jet	All	BERKOL 74					
		BERKOL 83					
Air-jet	All	BERKOL 74					
		BERKOL 83					

Preparation methods	Count range [ktex]	Cotton		
		Detaching	Delivery	Drafting
Comber	≤ 3.0	BERKOL 65 S	BERKOL 83	BERKOL 65 S
	3.0–4.2	BERKOL 65 S	BERKOL 83	BERKOL 65 S
	> 4.2	BERKOL 65 S	BERKOL 83	BERKOL 83

Preparation methods	Count range [ktex]	Cotton				MMF
		Carded		Combed		
Draw frame	0.3–0.5	BERKOL 70	BERKOL 65 S	BERKOL 74		
	0.5–1.0	BERKOL 74	BERKOL 70		BERKOL 74	
	> 1.0	BERKOL 74	BERKOL 83	BERKOL 74	BERKOL 83	BERKOL 83
Roving frame	≤ 2.5			BERKOL 65 S	BERKOL 74	
	2.5–3.5	BERKOL 74		BERKOL 65 S		BERKOL 74
	> 3.5	BERKOL 83		BERKOL 74	BERKOL 83	BERKOL 83

Core yarn	Technical fibers	Wool
BERKOL 74	BERKOL 70-83	BERKOL 74-83
BERKOL 74	BERKOL 70-83	BERKOL 74-83
BERKOL 74	BERKOL 70-83	BERKOL 74-83
BERKOL 70	BERKOL 70-83	BERKOL 74-83
BERKOL 70	BERKOL 70-83	
	BERKOL 74	
	BERKOL 83	
	BERKOL 74	
	BERKOL 83	

The cot types listed are merely a recommendation and are not binding.

The optimal product is determined based on:

Lapping from raw material:

The harder the cot, the lower the lap formation.

Cot service life:

The harder the cot, the longer the service life.

Yarn quality:

The softer the cot, the higher the yarn quality.

Yarn count:

The softer the cot, the thinner the yarn count that can be chosen.

Increasing strain on the top rollers due to higher speeds, press-down forces and temperature required new methods for assembling the rubber tube and the arbor to be developed.

BERKOL Alupress has been developed as a solution for this. The Alupress cover consists of a precise aluminum tube, onto which the rubber is extruded and then vulcanized.



### **Technical Advantages**

- The rubber coating is vulcanized stress-free, eliminating the risk of ozone cracks.
- The connection between the tube and the rubber guarantees optimal adhesion even under high pressure and at high temperatures.
- The Alupress can be easily and quickly pressed onto the top roller.
- The aluminum tube is adhered securely on the top roller.

### **Economic Advantages**

- It is simply pressed on with no need for manual adhering, saving time and costs.
- The surface can be ground immediately after pressing.
- No cleaning is required when replacing the first layer.

The Alupress cots can be pressed onto the arbors using manual, pneumatic or hydraulic presses. BERKOL presses guarantee precise guiding and positioning of the cot.

## BERKOL Aprons

BERKOL top aprons are capable of processing 100 % cotton as well as blends. “Bottom aprons” are available in both long and short designs as well as variants for regular or compact spinning.

With the I-HX8/U-HP and I-HX8/C-HP aprons, it is possible to increase the apron’s service life by up to 35 % compared to the popular I-HX8/U and I-HX8/C aprons. Yarn quality is also up to 10 % higher.

### These improvements are thanks to:

- Improved resistance against wear and tear due to minimal depression. This has a direct influence on the service life and the quality consistency of these aprons.
- Improved resistance against surface deformation quick recovery results in optimal gripping behavior and improved control of the fibers.
- Improved flex and ozone resistance leading to less cracking on the apron surface.
- Improved tensile strength and tear resistance, which reduces the risk of “snapping.”

Aprons	Expected service life	Color	Finish	Recommended applications
<b>I-HX8/U-HP</b> Top aprons	23–25 months	Inner layer olive green/ Outer layer gray	Antistatic	Universal high-performance aprons For spinning 100 % cotton and blends, for regular and compact spinning
<b>I-HX8/C-HP</b> Short bottom aprons Long bottom aprons	12–14 months 22–24 months	Inner layer dark green/ Outer layer gray	Antistatic	Universal high-performance aprons For spinning 100 % cotton and blends, for regular and compact spinning
<b>I-HX8/U</b> Top aprons	19–21 months	Inner layer olive green/ Outer layer light green	Antistatic	Universal standard aprons For processing 100 % cotton counts, for regular and compact spinning
<b>I-HX8/C</b> Short bottom aprons Long bottom aprons	10–12 months 18–20 months	Inner layer dark green/ Outer layer light green	Antistatic	Universal standard aprons For processing 100 % cotton counts, for regular and compact spinning
<b>HX-3/S</b> Bottom aprons		Inner layer dark green/ Outer layer dark blue	Antistatic	Aprons For processing synthetics and synthetic blends

# BERKOL Maintenance Machines

Spinning mills benefit from BERKOL comprehensive solutions through perfectly coordinated product lines that cover the entire spectrum of service and maintenance. BERKOL grinding and berkolizing machines and systems, presses, lubricating units and testing instruments for spinning mills are valued throughout the world.

## BERKOL Presses

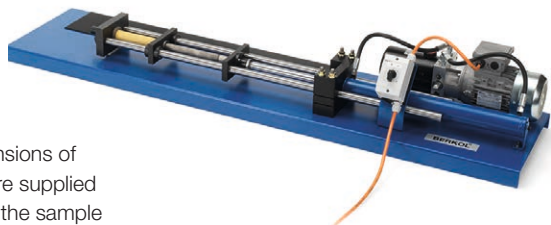
One of the key requirements for ensuring high yarn quality is ensuring the Alupress covers are fitted securely on the top rollers.

The exceptional precision and safety of BERKOL presses guarantee faultless, efficient operation. All Bräcker presses comply with CE standard regulations.

### Electrohydraulic Press APH50-H500EV

Electrohydraulic press for fitting and removing long Alupress cots used on preparation machines and combers.

Press range	Up to 490 mm
Core diameter	Up to 35 mm
Cover diameter	Up to 80 mm
Press pressure	Max. 29 000 N
Operating pressure	80–100 bar



### Range of Application

Tool sets for all commonly used dimensions of machines by various manufacturers are supplied from stock. Special tools as shown in the sample or drawing can be supplied with short delivery times.

### Pneumatic Press PP125-H100

Pneumatic press for fitting and removing short Alupress covers on ring, roving and air jet spinning and OE delivery top rollers.

Press range	20–45 mm
Core diameter	19–30 mm
Cover diameter	Up to 60 mm
Press pressure	At 6 bar: 6 500 N At 8 bar: 8 600 N
Operating pressure	6–8 bar



## Grinding Technology

The quality of the cot can only be ensured for its entire service life if it undergoes proper maintenance. This involves regular grinding to ensure optimal surface roughness and any necessary surface treatment of the freshly ground covers.

### Optimal care ensures:

- Smooth running
- Minimal lap formation
- Lower thread break rate

The grinding interval is determined based on:

- Cot shore hardness
- Machine type (conventional, compact, air)
- Fiber type

- Yarn quality deterioration (CV %, IPI)
- Thread break rate increase
- Cover wear and tear (rut formation)
- Film formation with resulting lap formation

Alongside the cover quality, the grinding intervals are determined mainly by the application and the quality demands of the customer.

Years of experience and close collaboration with customers have shown that **every spinning mill must develop and define its own optimal values.**

The information in the following table should therefore be used only as a guideline.

Application	Cover type	Yarn count range	Grinding interval h, conv. spinning	Grinding interval h, compact spinning
Ring spinning machine delivery top roller	Up to 70 shore A	Fine	1 250–1 750	625–875
	70–75 shore A		1 500–2 000	750–1 000
	76 shore A and above		2 000–2 500	1 000–1 250
The grinding intervals for the feed top rollers can be doubled	Up to 70 shore A	Medium	1 000–1 500	500–750
	70–75 shore A		1 250–1 750	625–875
	76 shore A and above	1 750–2 250	875–1 125	
	Up to 70 shore A	Coarse	Not recommended	Not recommended
70–75 shore A	1 000–1 500		500–750	
	76 shore A and above		1 250–1 750	625–875

Covers from 70 shore A and above are recommended for the delivery top roller in compact spinning machines. For softer covers, the grinding interval must be 20–30 % shorter.

Roving frame delivery top rollers	Up to 70 shore A		2 500–3 000	1 250–1 500
	70–75 shore A		3 000–3 500	1 500–1 750
	76 shore A and above		3 500–4 000	1 750–2 000
Draw frame	Up to 70 shore A		500–750	250–375
	70–75 shore A		500–750	250–375
	76 shore A and above		550–750	275–375
Combing: detaching roller drafting system delivery top rollers	67 shore A		1 500	750
	67 shore A		1 500	750
	80–82 shore A		1 500 (check)	750 (check)
Open end spinning machine delivery roller	80 shore A		1 500	750

The grinding depth depends on the wear and tear of the cover. Bräcker recommends a diameter of 0.2–0.3 mm.

The optimal surface roughness depends on the cover material, the application and the climate. The surface roughness has a particularly strong influence on the lap formation tendency of the cover. Good results were obtained with an average roughness (Ra) between 0.8 and 1.0  $\mu\text{m}$ .

The following factors are decisive for obtaining a defined surface roughness:

- Grinding machine
- Type of grinding disk
- Trimming of grinding disk
- Grinding machine settings

### Common Grinding Mistakes

It is widely agreed that the less material that is removed from the cot when grinding, the longer the service life of the cot. It is therefore a logical solution to ensure as little material is removed as possible.

Insufficient material removal leads to:

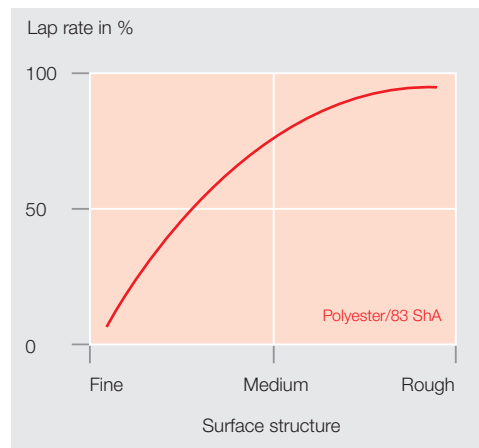
- No fresh rubber material on the “ground” surface
- Uneven surface roughness
- Uneven cot surface
- Unlevel cot surface

### Conclusion

In view of the risks to yarn quality, more frequent regrinding is necessary, thus shortening the service life.

BERKOL offers universal manual grinding machines or fully automated modular grinding systems with integrated surface treatment.

Roughness value Ra		Roughness class
$\mu\text{m}$ (micrometer)	$\mu\text{in}$ (microinch)	
50	2 000	N 12
25	1 000	N 11
12.5	500	N 10
6.3	250	N 9
3.2	125	N 8
1.6	63	N 7
0.8	32	N 6
0.4	16	N 5
0.2	8	N 4
0.1	4	N 3
0.05	2	N 2
0.025	1	N 1



## BERKOL multigrinder

The entire range of top rollers and long cots used in a spinning mill can be processed on a single machine. Any center-guided top roller design can be ground fully automatically on the BERKOL multigrinder. This system provides for a grinding capacity of up to 150 top rollers per hour, and the BERKOL multigrinder can be operated unattended for as long as 30 minutes.

In addition to the automatic grinding of top rollers, the BERKOL multigrinder also enables semi-automatic grinding of long cots with an axis length of up to 490 mm. Performing these two applications on one grinding machine reduces the number of grinding systems required in a spinning mill. Alternatively, the machine can be used as a backup for a BERKOL supergrinder.

The BERKOL multigrinder is a state-of-the-art solution for all spinning mills in which a high standard of quality is required for the grinding system while ensuring operation remains as economical as possible.

### **Fast and Flexible**

The BERKOL multigrinder can be easily adapted to a variety of different operating conditions. It is possible to switch from automatic grinding of top rollers to semi-automatic grinding of long cots (preparation cots) in a very short time and with no additional tools. The grinding parameters for different cots can be stored and retrieved at any time.

### **Efficient Operation Through Optimized Ergonomics**

The design of the BERKOL multigrinder has been optimized to optimally suit the average height of the operators, thus ensuring operation is as efficient and ergonomic as possible. The safety features correspond to the high requirements of the European CE standard.



BERKOL multigrinder MGLQ



## BERKOL multigrinder

### BERKOL multigrinder MGLQ – Automatic Grinding System

Grinding unit for semi-automatic grinding of preparation cots and automatic grinding of ring/compact spinning and roving top rollers, with additional processing control during the grinding process.



### BERKOL multigrinder MG – Semi-Automatic Grinding System

Grinding machine for semi-automatic grinding of preparation cots, OE nipping rollers (grinding on a mandrel) and taper grinding for special uses such as detaching rollers for combers. Optional grinding with top roller attachment for roving, ring and air-jet spinning top rollers.



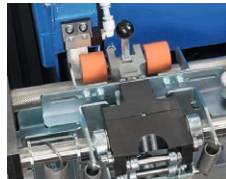
### For All Types of Top Rollers and Long Cots



Semi-automatic grinding of preparation cots with diameters from 19–140 mm and max. length of 500 mm



Semi-automatic grinding of air-jet and OE rollers.



Optional semi-automatic grinding of cots with auxiliary grinding device (top rollers, RSM, roving)

### Intuitive Operation



Touchscreen with simple multi-language user guidance and teaching mode. Capacity to store 50 grinding procedures

Machine	MGLQ	MG
Space requirement	3.2 x 2.8 m	2.8 x 2.0 m
Power	5 kW	
Compressed air/consumption	6–10 bar/150 l/min	
Grinding disk	Size	225 mm
	Width	20 mm
	Speed	2 800 rpm
	Manufacturer	BERKOL
Spindle speed	150–900 rpm	
Traversing speed	20–700 mm/min	
Machine control	PLC/step motor/frequency-controlled	
Control panel	Touchscreen	
Language	Multiple language options	
Fault diagnosis	Self-diagnosis on display	
<b>Operating programs</b>		
Manual grinding	●	●
Automatic	●	○
Grinding to size	●	●
Sorting (Q)	●	○
Dressing	Semi-automatic	
Storage magazine for center-guided top rollers	●	○
Magazine capacity at dia. 32 mm	≥ 70	n/a
Grinding accuracy	Rubber surface Ra > 0.5 µm and rotation accuracy < 0.02 mm	
Unattended operation	≈ 30 min	n/a
<b>Operating range</b>		
Min. diameter center-guided top rollers	24 mm	24 mm*
Max. diameter center-guided top rollers	42 mm (90 mm*)	90 mm*
Max. length center-guided top rollers	170 mm	
Min. diameter long cots	19 mm	
Max. diameter long cots	140 mm	
Max. length long cots	500 mm	
<b>Features</b>		
Balancing device	Integrated	
Standard tools	Included	
Safety	CE standard	
Country of origin	Switzerland	

\* with grinding attachment ● yes ○ no

## BERKOL supergrinder

### Fully Automatic Grinding System

The BERKOL supergrinder is based on a modular structure and is designed for automatic grinding and berkolizing of ring, roving and air-jet spinning top rollers.

The basic machine can be customized according to requirements, with modules for measuring covers, large magazines (up to 450 top rollers) and berkolizing module available as options. The measuring system offers different sorting programs, ensuring efficient quality control of the top rollers.

The specially developed grinding stone and versatile setting options allow optimal roughness values to be achieved. State-of-the-art technology enables the capacity to be increased to over 350 rollers per hour (depending on the target cover surface roughness).

The machine is operated via the user-friendly touchscreen panel with integrated operation guidance in German, English, Chinese, Italian, Spanish, Portuguese, Russian and Turkish.





Machine operation via user-friendly touchscreen panel with multi-language process guidance



BERKOL high-performance grinding stone

## Modular Structure

### Module L (LARGE)

- Large universal loading and unloading magazines
- Up to 2 hours of unattended operation (depending on cover diameter and fill level of magazine)
- Load capacity of up to 450 axles (depending on cover diameter)



Simple and ergonomic loading/unloading

### Module M (MEASURING)

- Integrated measuring system
- Can be used for differential grinding
- Sorting function without grinding
- Can also be used for grinding to size



Integrated measuring system

### Module B (BERKOLIZING)

The top roller covers are evenly berkolized directly after grinding with no additional labor costs. This automatic module is electronically controlled and works in synchronization with the grinding process.

Berkolizing offers the following advantages:

- Fewer laps
- Reduced spindle downtime
- Fewer damaged covers
- More economical production



Fully integrated berkolizing module

## BERKOL berkolizer

- A revolving drawer enables simultaneous berkolizing and loading of the top rollers, increasing efficiency in the roll shop.
- The specially developed 1 000-watt UV lamp with highly concentrated and even irradiation strength enables a very short cot exposure time.
- The service life and efficiency of the UV lamp is greatly improved by the uninterrupted “running” behavior of the berkolizer that results from the low heat build-up properties of the UV lamp.
- Reduced energy consumption and low maintenance costs reduce operating expenses considerably.

- Compact and user-friendly design
- A small investment with extensive benefits
- Environmentally friendly and proven process that improves cot performance.

Berkolizing the top rollers improves the running behavior of spinning machines. However, berkolization cannot make up for poor cot quality and finish. Optimal grinding must be ensured before berkolizing, and the duration of the berkolizing process for the top rollers must also be suitable.



## BERKOL Surface Treatment: Berkolizing

The fiber material being processed, the climate and the spinning machine can all lead to the formation of laps on the top roller covers. In the past, this has been prevented by treating the covers with lacquers, hydrochloric acid solutions, iodine and similar.

However, these treatments are time-consuming, expensive and often harmful to the environment. They may also corrode the metal.

Nowadays, these agents tend to be avoided. They have been almost completely replaced with surface treating by means of UV radiation, also referred to as berkolizing. In this process, the treatment is applied after grinding the covers, which results in artificial aging of the rubber surface and reduces the abrasion coefficient. Even when performed regularly, the cover material does not become hard or damaged. But an optimal radiation time is also very important for success.

This process offers the following advantages:

- Simple and fast
- Inexpensive
- Environmentally friendly

The BERKOL berkolizer offers users the following advantages:

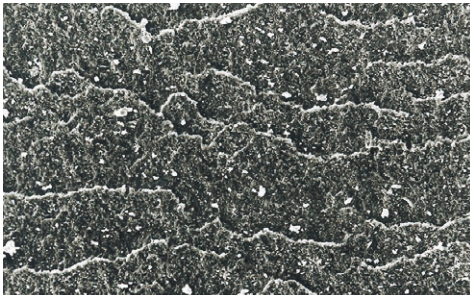
- Fewer issues when running in newly ground covers
- Good running characteristics
- Higher yarn quality
- Lower labor requirement
- Lower costs

The duration of the berkolizing process is a crucial factor for success. It should always be as short as possible. Berkolizing for too long reduces the friction coefficient of the covers, which leads to thread breaks.

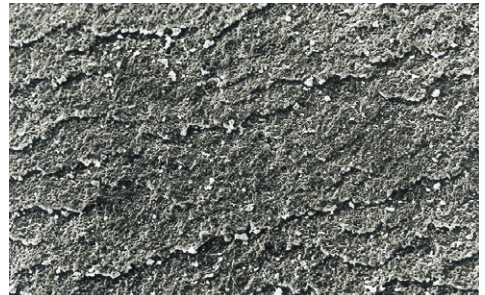
The duration of the treatment depends on:

- Application (ring spinning, combing, etc.)
- Climate
- Fiber material
- Cover properties
- Type of berkolizing machine

Due to the wide variety of influencing factors, each customer should determine the optimal berkolizing time through trials. Bräcker provides recommendations and standard values for the relevant applications in the instruction books for the manual and automatic berkolizing machines.



Unberkolized



Berkolized

## BERKOL Testing Device

### Concentricity Tester

Top-quality yarn can only be spun with perfectly smooth-running top rollers. BERKOL testing devices are crucial for quality assurance.

They identify faults, which helps save money.

The top roller testing device form BERKOL can be used to check the parallelism and smooth running of all the top rollers in a spinning mill.

The BERKOL testing device is a precision instrument. It is supplied in a solid, practical hardwood box that protects the device form dust and dirt.



Measuring range:	
Roller diameter	20 mm to 100 mm
Max. roller length	450 mm
Measuring sensor	0.8 mm
Pitch	0.01 mm

The hardened and ground contact rollers are driven by a smooth-running electric motor.

The freely moving measuring carriage runs on a precision guide without play. The ball joint supports enable fast, precise positioning of the precision measuring sensors.

Faults related to smooth running, parallelism or wear and tear can be measured accurately to 0.01 mm.





## BERKOL Surface Finish Measuring Device

### Roughness Tester

The surface texture greatly influences the running behavior of the top roller covers. This can be checked with the lip, a magnifying glass or a surface finish measuring device. One advantage of surface finish measuring devices is that the coarseness can be quantified and documented with a measured value.

The perthometer supplied by BERKOL is especially well suited to measuring soft materials.





## BERKOL Shore Hardness Testing Device

### HPSA R 35 M

The hardness of top roller covers greatly influences the draft performance and thus the yarn quality. It is usually measured in shore A. Standard measurement in accordance with DIN 53505 stipulates a minimum coating thickness of 5 mm and a press-on force of 1 kg. The measurement on a drum therefore usually differs from the effective value.

The BERKOL hardness testing device is fitted with an appliance that ensures the correct press-on force is used.



## BERKOL Lubrication Devices

Technical progress means that modern spinning mills with high-performance machines now require fewer operating personnel, and this in turn requires suitable maintenance solutions for all production machines and appliances.

We have worked closely with users to develop efficient lubrication appliances that surpass conventional manual devices.

Regular lubrication significantly extends the service life of the bearings.

### BERKOLUBE

Up to 800 top roller bearings in ring spinning machines or roving frames can be lubricated per hour with this pneumatic lubrication device, which ensures an exact dosage of the required amount of grease.

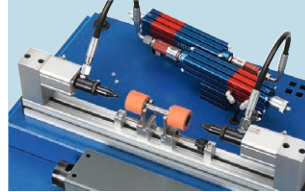
Various take-up tools and lubrication nozzles are available to adapt the device to the different top roller types. The device can be adjusted very quickly to the various top roller types.

### Technical Data

- Amount of grease per bearing can be adjusted from 0.2 cm<sup>3</sup> to 2.0 cm<sup>3</sup>
- Capacity of 600 to 800 top rollers per hour
- CE-compliant with pneumatic two-hand safety control
- A 25-kg grease container is sufficient for 20 000 to 22 000 top rollers
- Grease standard supply:  
Klüber Staburags NBU 12/300 KP

### Lubricating Unit BOS-01

The BOS-01 is a manual lubrication device for all axially lubricated top rollers. The standard equipment is suitable for top rollers with a tube diameter of 19 mm to 80 mm. Suitable tools can be provided for other top roller types.









# Bräcker

We have been successfully serving our customers in the textile industry since 1835



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Swiss Premium Quality

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