



## Ceramic Thread Guides RAPAL®

### Catalogue

## **Keramische Fadenführer von Rauschert**

*Mit über 100 Jahren Erfahrung in der Herstellung von Keramik im Zentrum der europäischen Textilindustrie, ist Rauschert als Keramikhersteller hervorragend geeignet, Qualität und Wissen über Anwendungen an die Textilindustrie weltweit anzubieten.*

*Mit einem ausgewählten Team von Ingenieuren, Technikern und Experten für textile Anwendungen ist Rauschert ein führender Hersteller von Fadenführern und ist vorbereitet, die Textilindustrie bei der Entwicklung innovativer Produkte für das 21. Jahrhundert zu unterstützen.*

*Lassen Sie Rauschert dabei helfen Ihre textilen Prozesse zu verbessern.*

*Rauschert bietet eine große Reihe von Keramikmaterialien mit jeweiligen Eigenschaften an, die gut geeignet sind verschiedene Probleme im textilen Bereich zu lösen.*

### Liste der Materialien und deren Eigenschaften

<b>Physikalische Eigenschaften</b>	<b>Einheit</b>	<b>Rapal®</b>	<b>Rapal® 100</b>	<b>Rapal® 200</b>	<b>Rapal® 200AZ</b>	<b>Titania</b>	<b>Zirconia Y</b>	<b>Zirconia M</b>
Aluminumoxidgehalt	Gewicht %	98,0	99,7	99,7	85	-	-	-
Zirkonoxidgehalt	Gewicht %	-	-	-	15	-	95	96
Titanoxidgehalt	Gewicht %	-	-	-	-	92	-	-
Dichte	g/cm <sup>3</sup>	3,70	≥3,85	>3,9	4,1	4,05	>5,85	≥5,65
Farbe		weiß/rot	weiß/rot	elfenbein/pink	weiß	creme	weiß	gelb
Porosität	%	0	0	0	0	0	0	0
Wärmeleitfähigkeit	W / m · K	20	25	25	23	2,5	2,5	2,0
Vickershärte	HV 10	1500	1800-2000	1800-2000	1600	1100	1200-1400	1100

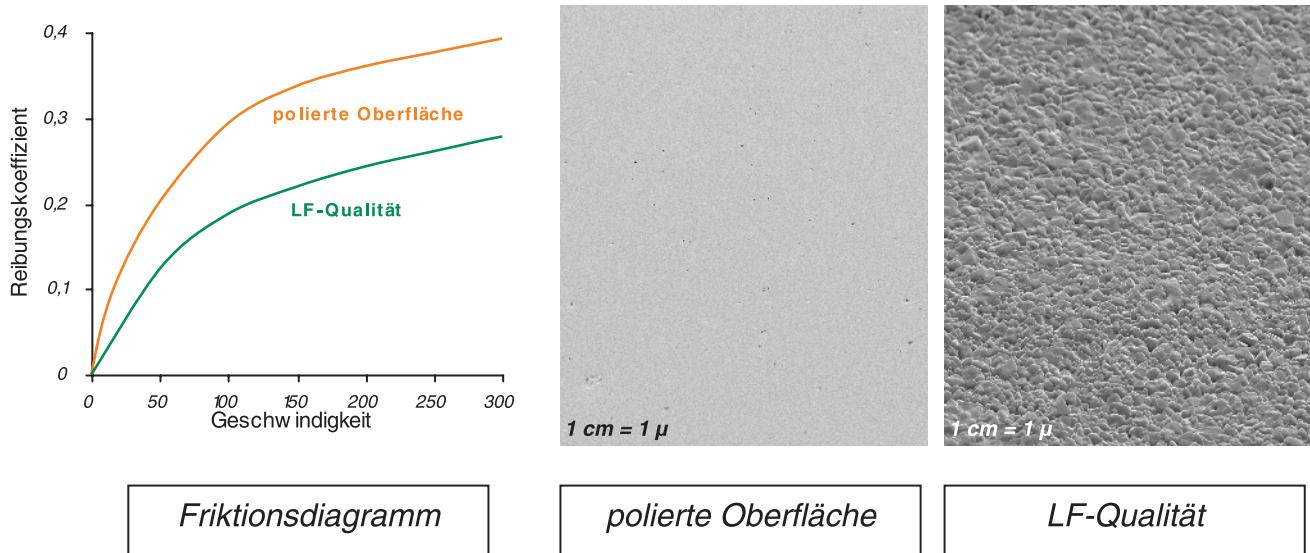
### Reibung

*In jedem textilen Prozess ist es normalerweise wünschenswert, die Fadenspannung zu minimieren. Um dies zu erreichen muss die Reibung zwischen dem bewegten Garn und der keramischen Kontaktobерfläche kontrolliert werden. Die Reibungskraft ist vor allem aus zwei Komponenten zusammengesetzt:*

- die abrasive Kraft
- die Adhäsionskraft

*Für ein bestimmtes Garn (z. B. verdreht oder flach) muss somit die Oberfläche so beschaffen sein, dass beide Komponenten minimiert werden. Dies kann durch eine Optimierung der Kontaktfläche und durch Minimierung der Oberflächenunebenheiten erreicht werden.*

*Fehler hierbei führen entweder zu starkem 'Schnee' oder zu gebrochenen Garnfilamenten/Schlingen und zu hohen Fadenspannungen. Rauschert hat eine Reihe von hochqualitativen Keramikmaterialien und verschiedene Fertigungsprozesse entwickelt, um dies zu vermeiden. Darüber hinaus ist Rauschert in der Lage, mit der Hilfe eines Reibwertmessgerätes bei der Verbesserung der textilen Prozesse Unterstützung zu leisten.*



### Typische Anwendungen von Rauschert-Fadenführern

#### Schmelzspinnen

Rauschert bietet eine umfassende Auswahl von Fadenölen an, die für eine Reihe von unterschiedlichen Garnen und Spinngeschwindigkeiten von LOY und POY bis zu HOY und FDY geeignet sind. Die Oberfläche Rapal 200 NE bietet die niedrigst mögliche Reibung für Hochgeschwindigkeits-Anwendungen.

Ergänzend hierzu gibt es eine große Reihe von Changierfadenführern und anderen Fadenführern für verschiedene Arten von Maschinen.

#### Strecktexturieren

Rapal 200 ist ein feinkörniges sehr reines Aluminiumoxid, dass besonders für die hohen Anforderungen des ‚Hochgeschwindigkeits-Strecktexturieren‘ geeignet ist. Bei jeder Stufe des DTY-Prozesses muss sowohl die Oberflächenqualität als auch die Oberflächenrauheit der Fadenführer genau kontrolliert werden, um ein fehlerfreies Endprodukt zu erreichen.

Rauschert bietet bekannte Formen von Einlassführungen für Heizer, Aufwickelfadenführer und Drallstopper in einer Reihe von Materialien und Oberflächenbeschaffenheiten einschließlich diamantpoliert, LF-Qualität (N, NE, PN) und natürlicher Oberflächen. Alle Qualitäten wurden für die schnell laufenden und wechselnden Garnconfigurationn entwickelt.

#### OE-Spinnen

Rauschert bietet eine große Reihe von hochglanzpolierten Keramikabzugsdüsen mit oder ohne Metallhalterungen an.

#### Andere textile Prozesse

Rauschert liefert ein breites Standardsortiment an Fadenführern für die Strickerei oder Weberei.

#### Toleranzen

Toleranzen für normale Produktion sind  $\pm 2\%$  für Maße über 10 mm und  $\pm 0,2$  mm für Maße unter 10 mm.

Wenn jedoch engere Toleranzen benötigt werden, kann dies durch Präzisionsschleifmaschinen erreicht werden.

## **Rauschert Ceramic Threadguides**

### Introduction

*With over 100 years experience of ceramic manufacturing in the heart of the European textile machinery industry, Rauschert is uniquely placed in offering ceramic materials, quality and applications knowledge to the textile industry worldwide. With its dedicated team of engineers, technologists and textile application experts, Rauschert is the leading German manufacturer of yarn guides and is committed and prepared to serve the needs of the textile industry into the 21<sup>st</sup> Century. Let Rauschert help you improve your textile process.*

*Rauschert offers a wide range of ceramic materials, with a corresponding range of properties ideally suited to solving different textile problems.*

### Materials List and Properties

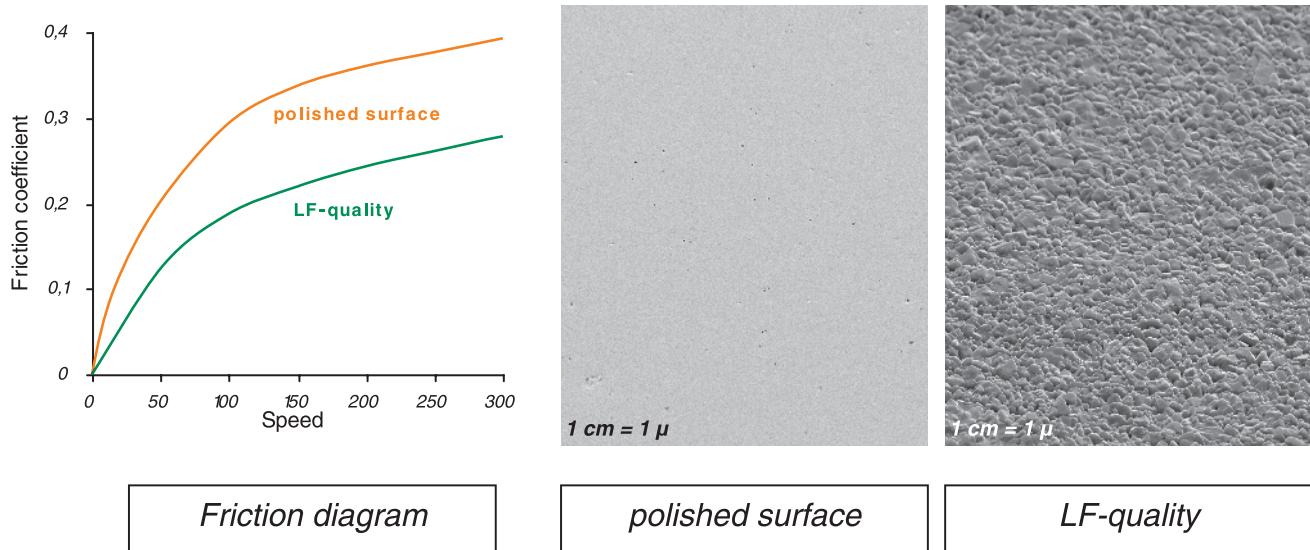
<b>Physical Characteristics</b>	<b>Unit</b>	<b>Rapal®</b>	<b>Rapal® 100</b>	<b>Rapal® 200</b>	<b>Rapal® 200AZ</b>	<b>Titania</b>	<b>Zirconia Y</b>	<b>Zirconia M</b>
Content of aluminium oxide	weight %	98,0	99,7	99,7	85	-	-	-
Content of zirconium oxide	weight %	-	-	-	15	-	95	96
Content of titanium oxide	weight %	-	-	-	-	92	-	-
Density	g/cm <sup>3</sup>	3,70	≥3,85	>3,9	4,1	4,05	>5,85	≥5,65
Colour		white/red	white/red	ivory/pink	white	creme	white	yellow
Porosity	%	0	0	0	0	0	0	0
Thermal Conductivity	W / m · K	20	25	25	23	2,5	2,5	2,0
Hardness acc. to Vickers	HV 10	1500	1800-2000	1800-2000	1600	1100	1200-1400	1100

### Friction

*In any textile process it is usually desirable to minimise yarn tensions and in order to achieve this, the friction between the moving yarn and the ceramic contact surface must be controlled. The frictional force is comprised primarily of two components:*

- the ploughing (abrasive) force
- the adhesive force

*It follows therefore that for a particular yarn (e.g. twisted or flat) the ceramic surface should be engineered to reduce both of these components, by optimising the actual contact area and minimising ceramic surface defects. Failure will result in either excessive 'snow', or broken filaments/loops and high yarn tensions. Rauschert has developed a range of high quality ceramic materials and special surface finishing processes in order to avoid this and furthermore, are then able to assist customers optimise their textile process with the help of a high speed Friction Meter.*



### Typical Applications for Rauschert Threadguides

#### Melt Spinning

Rauschert offers a comprehensive selection of spin finish applicators, suitable for a range of deniers and spinning speeds for LOY and POY to HOY and FDY.

The Rapal 200 'NE-Quality' surface is recommended as giving the lowest possible friction for high-speed applications.

Complementary to this is a full range of traverse guides and other associated guides suitable for many makes of machine.

#### Drawtexturing

Rapal 200 is a fine grain high purity alumina especially suited to the rigorous demands of high-speed drawtexturing. Each stage of the DTY process requires precise attention to both the surface quality and roughness of the threadguides in order to ensure a defect free end product.

Rauschert offers popular shapes of heater entry guides, take-up guides, and twiststops in a range of materials and surface finishes including diamond polished, 'LF-Quality' (N, NE, PN) and natural, all engineered to cope gently with the fast moving and changing yarn configuration.

#### Open-End Spinning

Rauschert offers a big range of highly polished ceramic navels with or without metal holding device.

#### Other textile processes

Including twisting, knitting, weaving and creels.

#### Dimensional Tolerances

Dimensional tolerances for normal manufacture are  $\pm 2\%$  for dimensions over 10 mm and  $\pm 0.2$  mm for dimensions under 10 mm.

However should closer tolerances be necessary, then this can be arranged using precision grinding equipment.

# Ceramic Friction Discs

for the texturing process

- **Working Discs**
- **Guide Discs**

## Ceramic manufacturing from raw-material to finished product

- Rauschert now manufactures ceramic friction discs for all PES-, PA- und PP-Texturing Processes.
- The friction discs can be used in all common makes of Friction Units.



**Send us your enquiries!**

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### Product Characteristics

- high deformation resistance
- stable roughness values
- good shock resistance
- high regularity
- long life-time

### Process Characteristics

- high yarn speed
- yarn gentle
- low snow
- low yarn tension forces T1 / T2
- Titer range up to dtex 330

### Textile Technology

- high yarn strength
- very good elongation values
- excellent crimp contraction
- high crimp stability
- consistent yarn quality

## Working Discs

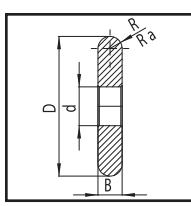
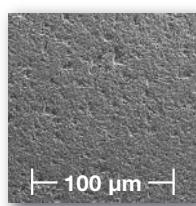
part-number		diameter	bore	thickness	radius	roughness
Rauschert	CICE	D [mm]	d [mm]	B [mm]	R [mm]	Ra [ $\mu\text{m}$ ]
90531-1	GAL 6045 T195 0,85	52	14,45	9	5,5	0,85
90554-2	GAL 6025 T195 1,30	45	12	6	3,7	1,3
90555-3	GAL 6012 T195 0,85	49,62	12	6	3,5	0,85
90531-4	GAL 6045 T195 1,10	52	14,45	9	5,5	1,1
90554-4	GAL 6025 T195 0,85	45	12	6	3,7	0,85
90531-3	GAL 6045 T195 1,30	52	14,45	9	5,5	1,3
90606-1	GAL 6064 T195 0,85	52	12	9	5,5	0,85

## Guide Discs

part-number		diameter	bore	thickness	radius	roughness
Rauschert	CICE	D [mm]	d [mm]	B [mm]	R [mm]	Ra [ $\mu\text{m}$ ]
90531-2	GAL 6045 T199 0,30	52	14,45	9	5,5	0,30
90554-1	GAL 6025 T195 0,30	45	12	6	3,7	0,30
90554-3	GAL 6025 T199 0,30	45	12	6	3,7	0,30
90551-2P	GAL 6064.03 T199 0,30	52	12	9	5,5	0,30
90555-1	GAL 6012 T199 0,30	49,62	12	6	3,7	0,30
90555-2	GAL 6012 T195 0,30	49,62	12	6	3,7	0,30

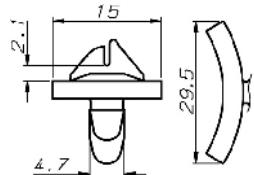
Other types available on request

Reference Data to texturing process							Working Discs / Guide Discs					
No.	Titer	Process Speed [m/min]	Heater Temperature [°C]	Draw ratio	D / Y	Friction Discs [ØxB]	Disc Arrangement	Yarn tension force at friction unit T1 / T2 [cN]	Tenacity [cN/dtex]	Crimp Contraction [%]	Crimp stability [%]	Elongation [%]
1	PES dtex 167 f30	800	420	1,72	2,00	52x9	1-8-1	71 / 69	4,10	42,9	91,8	22,8
2	PES dtex 167 f30	700	220	1,70	2,00	52x9	1-8-1	62 / 60	4,06	46,8	94,3	21,0
3	PES dtex 110 f36	800	360	1,60	2,00	52x9	1-8-1	44 / 42	4,17	40,6	89,0	21,0
4	PES dtex 76 f24	900	340	1,62	2,00	52x9	1-8-1	36 / 34	4,32	46,5	88,8	21,6
5	PA 6,6 dtex 78 f23	800	330	1,40	2,00	52x9	1-7-1	44 / 44	4,59	41,7	94,7	22,9
6	PA 6,6 dtex 44 f13	900	300	1,40	2,00	52x9	1-7-1	25 / 25	4,54	55,3	96,2	25,2
7	PA 6,6 dtex 22 f7	900	240	1,32	2,00	52x9	1-6-1	13 / 15	4,68	59,2	96,2	27,5
8	PA 6,6 dtex 33 f34	700	202	1,269	1,95	52x9	1-6-1	22 / 21	4,21	44,9	92,1	22,1



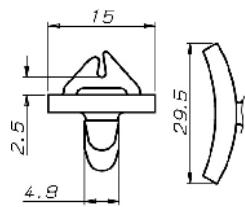
**Experience,  
capability and  
clear targets**

Rauschert is versatile  
in material, form  
and surface!



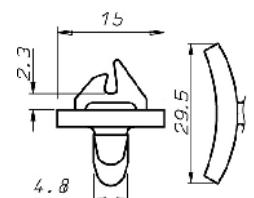
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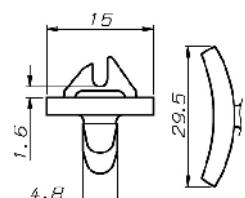
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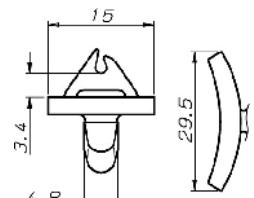
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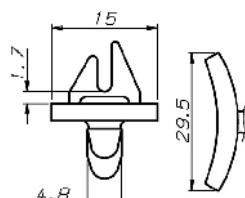
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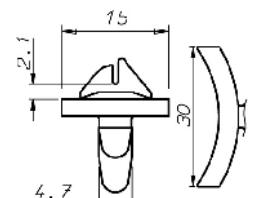
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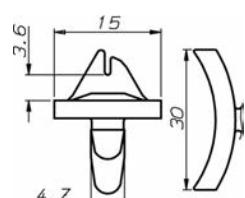
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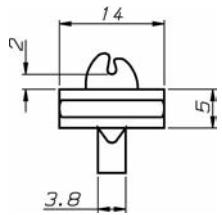
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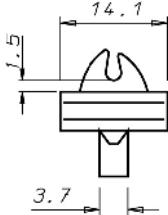
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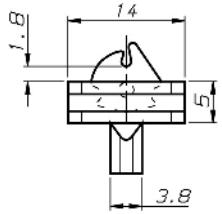
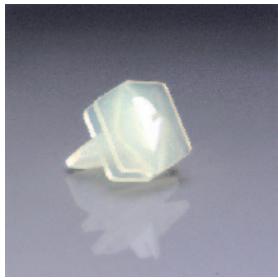
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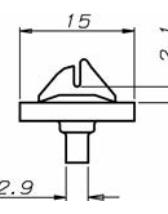
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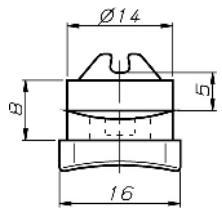
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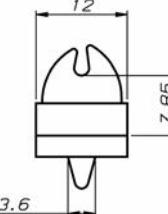
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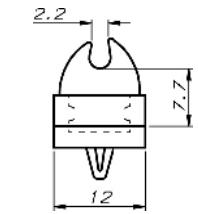
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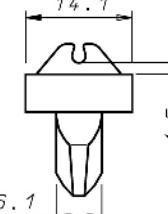
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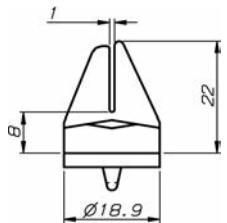
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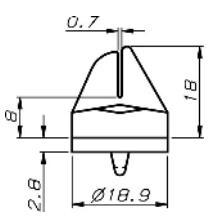
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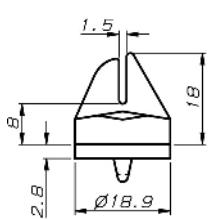
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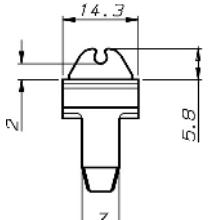
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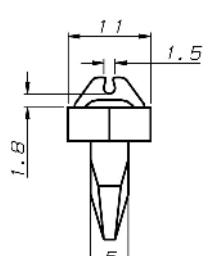
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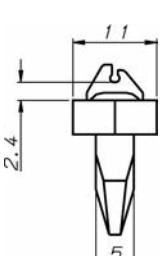
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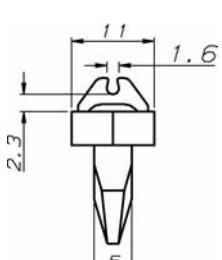
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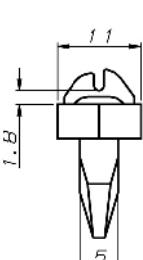
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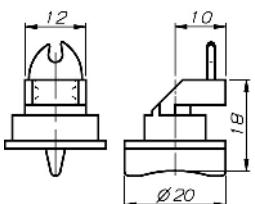
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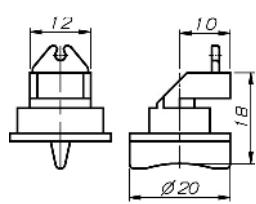
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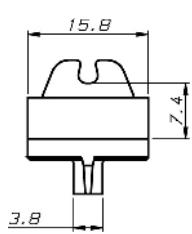
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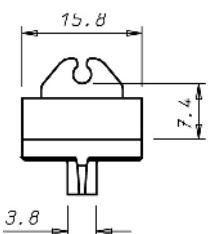
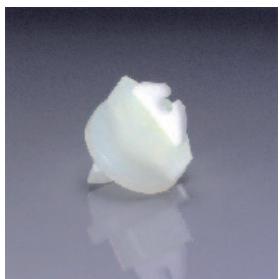
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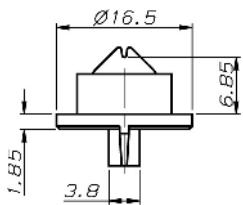
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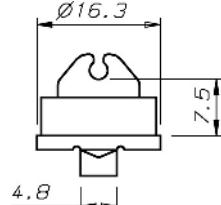
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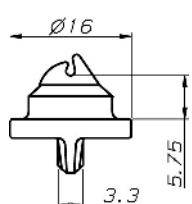
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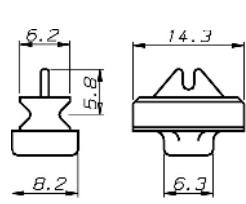
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Art.-No.: 3.94406/8844



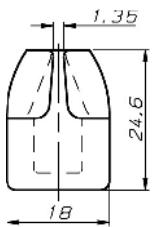
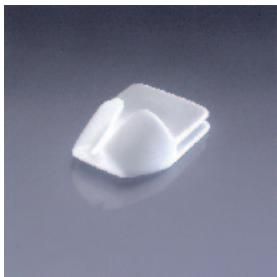
Mat: Rapal 100

Art.-No.: 3.94282/8814



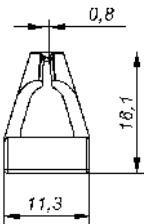
Mat: Rapal 100

Art.-No.: 3.94228/8832



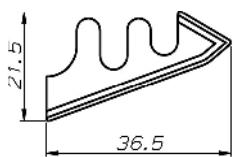
Mat: Rapal 100

Art.-No.: 3.94488



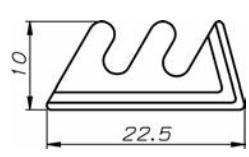
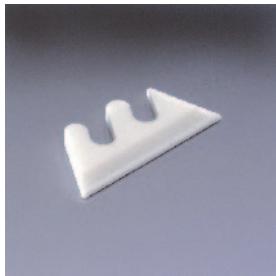
Mat: Titania

Art.-No.: 3.94795 GP



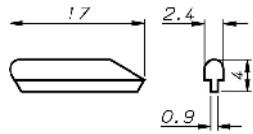
Mat: Rapal 200

Art.-No.: 3.90186



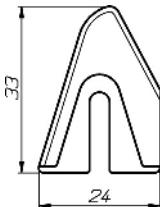
Mat: Rapal 200

Art.-No.: 3.90185



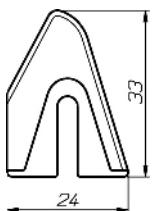
Mat: Rapal 100

Art.-No.: 3.94382



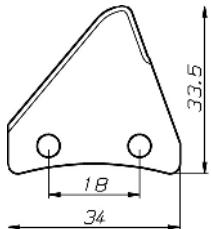
Mat: Rapal 200 AZ

Art.-No.: 3.90265 AZ



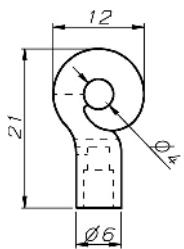
Mat: Rapal 200 AZ

Art.-No.: 3.90266 AZ



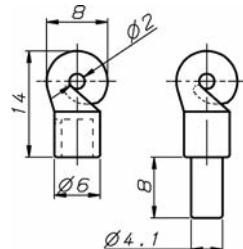
Mat: Rapal 200 AZ

Art.-No.: 3.90267 AZ



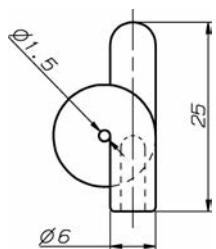
Mat: Rapal 100 R

Art.-No.: 3.94537 R



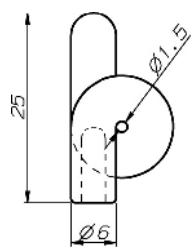
Mat: Rapal 200  
with metal holder

Art.-No.: 3.94565  
Art.-No.: 3.94565/8716



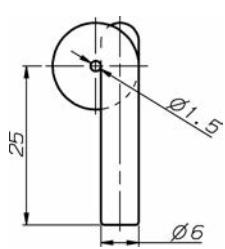
Mat: Rapal 200

Art.-No.: 3.94683



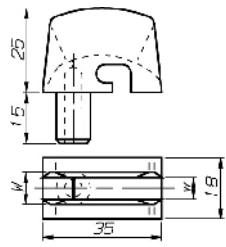
Mat: Rapal 200

Art.-No.: 3.94570



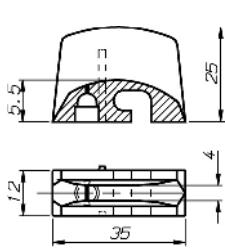
Mat: Rapal 200

Art.-No.: 3.94600



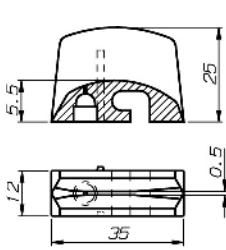
Mat: Rapal 100

Art.-Nr.	w	w
3.94608	6,0	3,0
3.94609	7,5	4,5
3.94610	10,5	7,5
3.94611	13,0	10,0



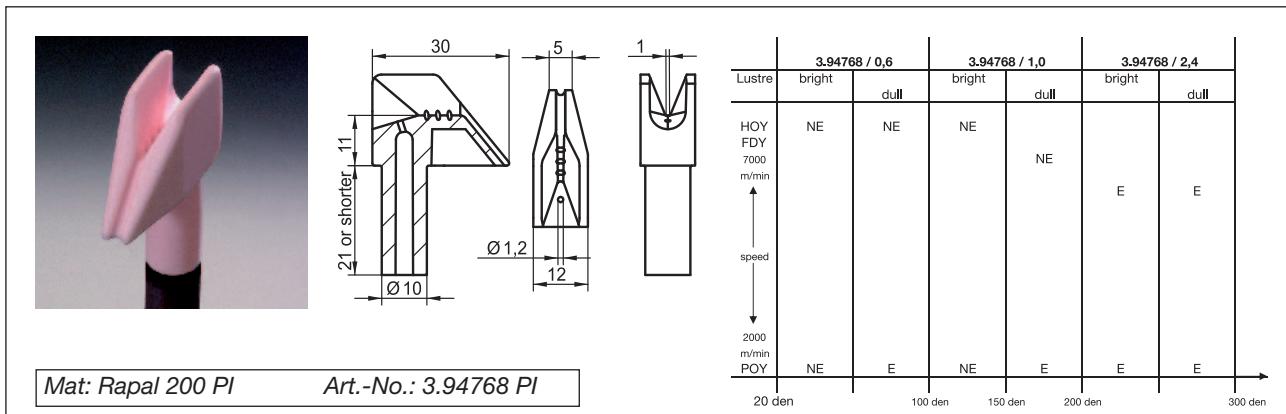
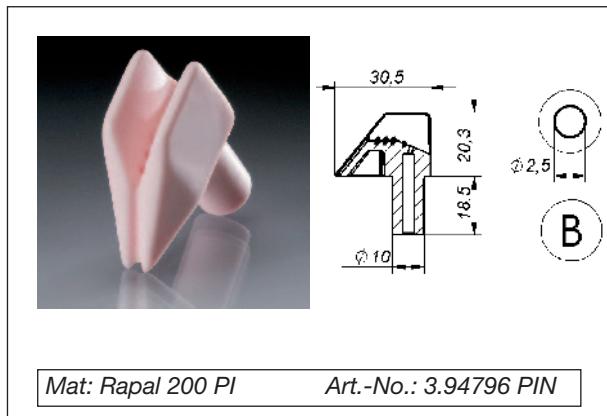
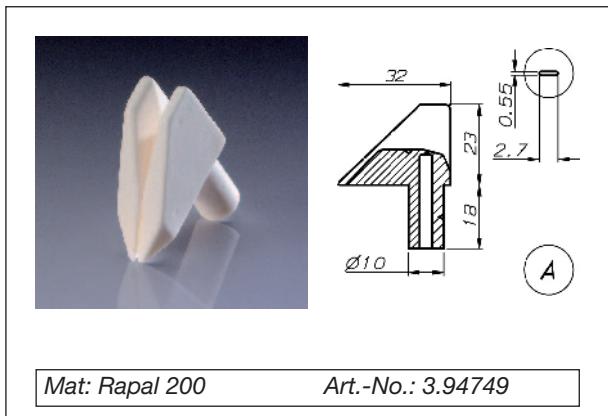
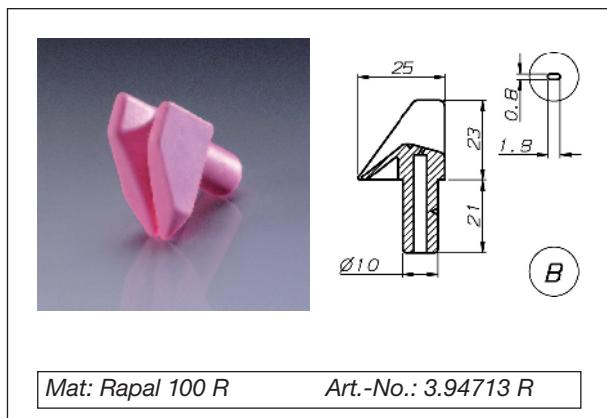
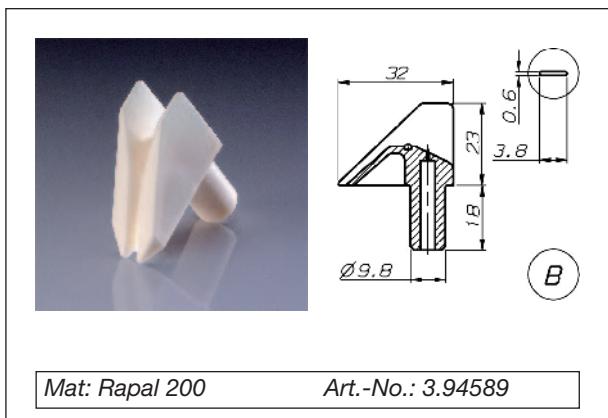
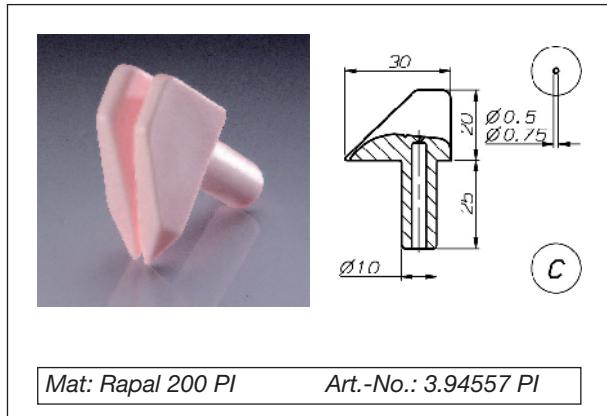
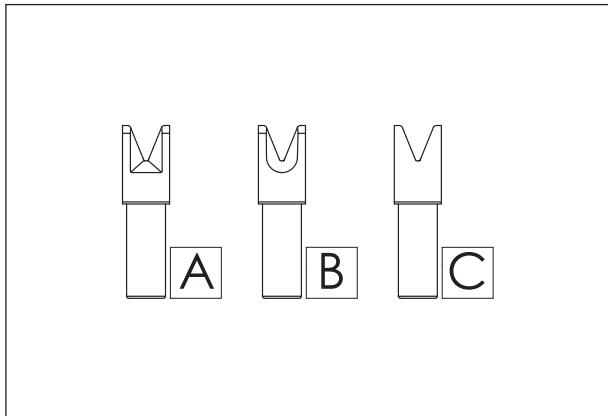
Mat: Rapal 100

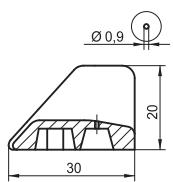
Art.-No.: 3.94116



Mat: Rapal 100 R

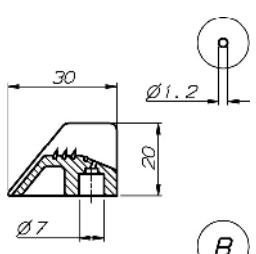
Art.-No.: 3.94126 R





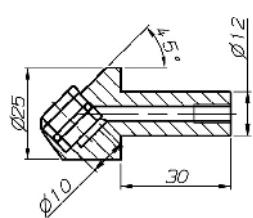
Mat: Rapal 100

Art.-No.: 3.94398

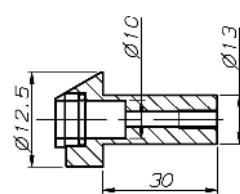


Mat: Rapal 200

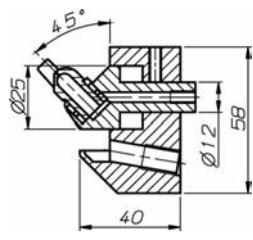
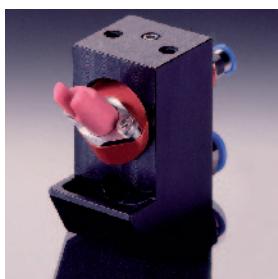
Art.-No.: 3.94726



Art.-No.: 7.8902/4

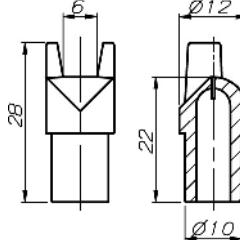


Art.-No.: 7.8902/5



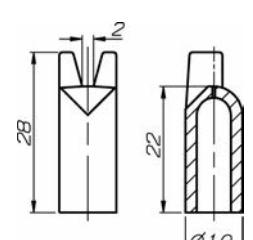
Mat: Rapal 100

Art.-No.: 7.8903/4



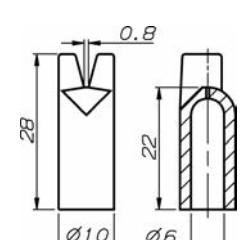
Mat: Rapal 100 R

Art.-No.: 3.94453 R



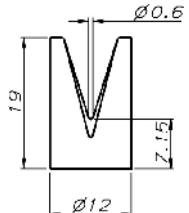
Mat: Rapal 100 R

Art.-No.: 3.94454 R



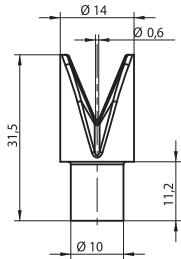
Mat: Rapal 100 R

Art.-No.: 3.94525 R



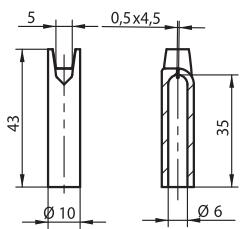
Mat: Rapal 100

Art.-No.: 3.94594 P



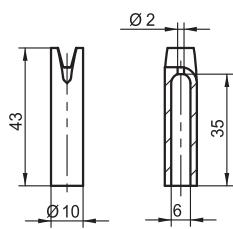
Mat: Rapal 100

Art.-No.: 3.90094



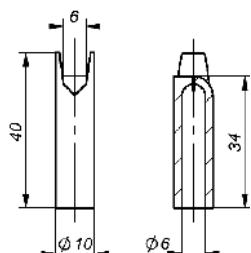
Mat: Rapal 100

Art.-No.: 3.94336/43



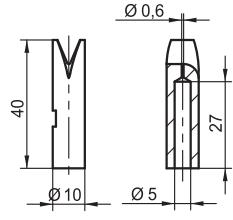
Mat: Rapal 100

Art.-No.: 3.94337/43



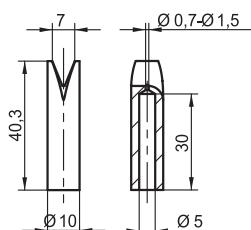
Mat: Rapal 100

Art.-No.: 3.94338/43



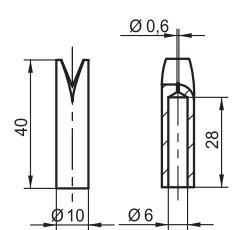
Mat: Rapal 100

Art.-No.: 3.90046/1,1



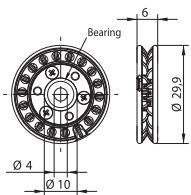
Mat: Rapal 100

Art.-No.: 3.9363/1,5

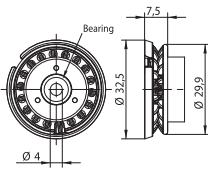


Mat: Rapal 100 R

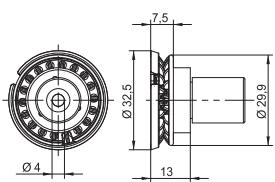
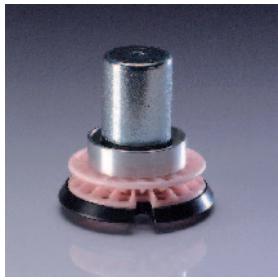
Art.-No.: 3.90227/40 R



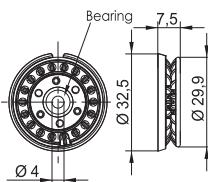
Mat: Rapal 200 PI Art.-No.: 3.94671/8765 PIP



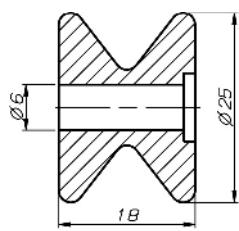
Mat: Rapal 200 PI Art.-No.: 3.94671/8766 PIP



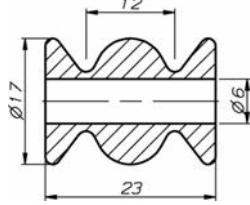
Mat: Rapal 200 PI Art.-No.: 3.94671/8722 PIP



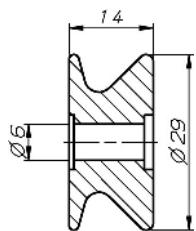
Mat: Rapal 200 PI Art.-No.: 3.94671/8741 PIP



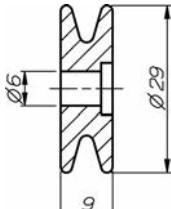
Mat: Titania Art.-No.: 3.90264 GP



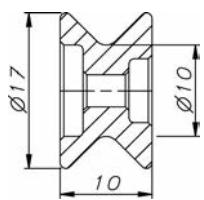
Mat: Titania Art.-No.: 3.90262 GP



Mat: Rapal 200 Art.-No.: 3.90263 P  
Art.-No.: 3.90263 LF

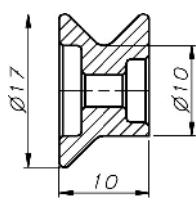


Mat: Rapal 200 Art.-No.: 3.90101 P  
Art.-No.: 3.90101 LF



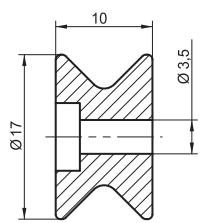
Mat: Rapal 200 AZ

Art.-No.: 3.90322 AZP



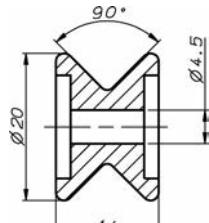
Mat: Rapal 200 AZ

Art.-No.: 3.90197 AZP



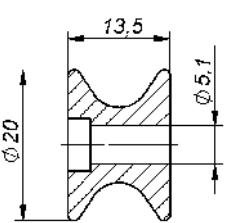
Mat: Titania

Art.-No.: 3.90361 GP



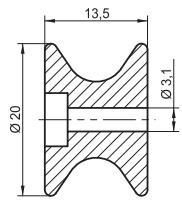
Mat: Rapal 200

Art.-No.: 3.90142 P



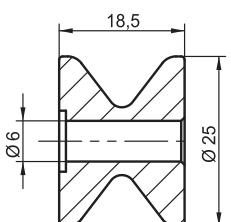
Mat: Titania

Art.-No.: 3.90363 GP



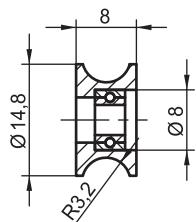
Mat: Titania

Art.-No.: 3.90363-1 GP



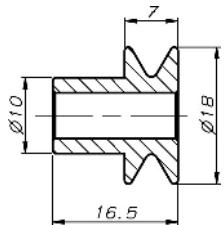
Mat: Rapal 100

Art.-No.: 3.90112



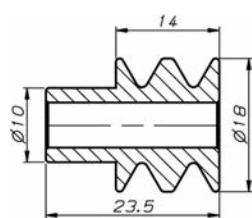
Mat: Rapal 100 R

Art.-No.: 3.92094/8724 RP



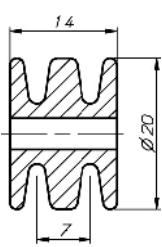
Mat: Rapal 200

Art.-No.: 3.90242 P



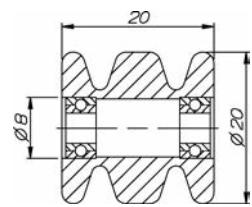
Mat: Rapal 200

Art.-No.: 3.90244 P



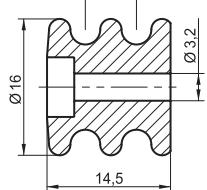
Mat: Rapal 100

Art.-No.: 3.91701



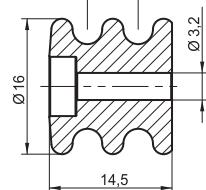
Mat: Rapal 100

Art.-No.: 3.90291/8723



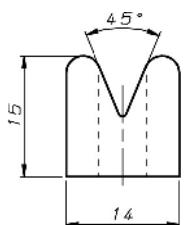
Mat: Rapal 200 AZ

Art.-No.: 3.90362 AZP



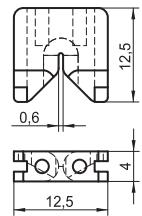
Mat: Titania

Art.-No.: 3.90340 GP



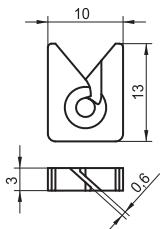
Mat: Rapal 100

Art.-No.: 3.94342 P



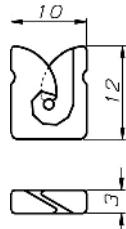
Mat: Rapal 200

Art.-No.: 3.94487 P



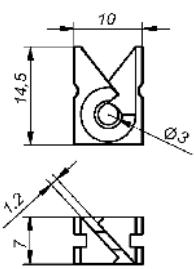
Mat: Rapal 200 PI

Art.-No.: 3.94751 PIP  
3.94751 LF



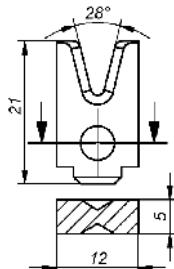
Mat: Rapal 200 PI

Art.-No.: 3.94681 PI



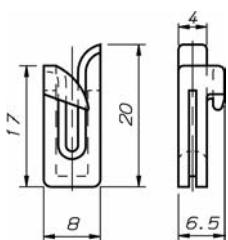
Mat: Rapal 200

Art.-No.: 3.99001



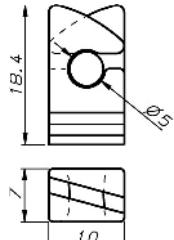
Mat: Rapal 200

Art.-No.: 3.99002



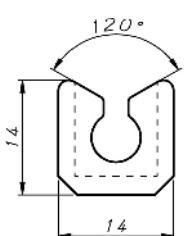
Mat: Rapal 100

Art.-No.: 3.94490



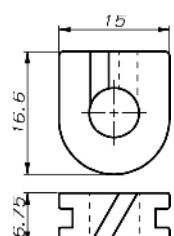
Mat: Rapal 100 R

Art.-No.: 3.94144 R



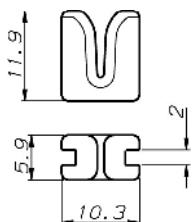
Mat: Rapal 100 R

Art.-No.: 3.94013 R



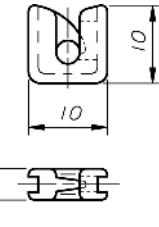
Mat: Rapal 100

Art.-No.: 3.9365 P



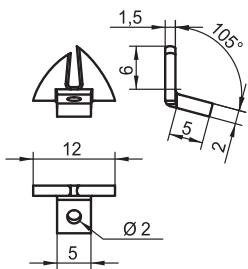
Mat: Titania

Art.-No.: 3.94752 GP



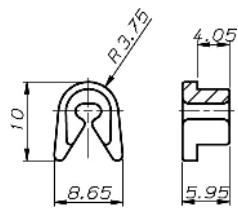
Mat: Rapal 100

Art.-No.: 3.94532



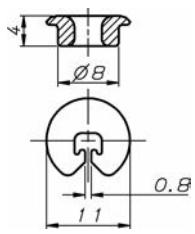
Mat: Rapal 200

Art.-No.: 3.99000



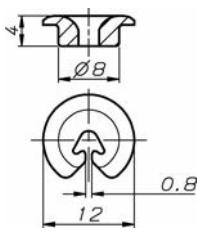
Mat: Rapal 100

Art.-No.: 3.94465



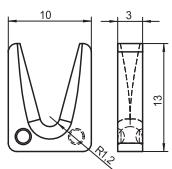
Mat: Titania

Art.-No.: 3.94793 GP



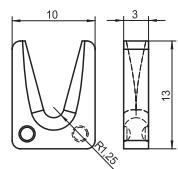
Mat: Titania

Art.-No.: 3.94517 GP



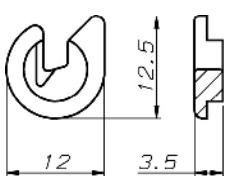
Mat: Rapal 200 PI

Art.-No.: 3.94845 PIP



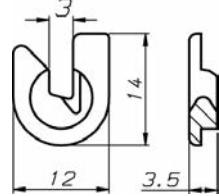
Mat: Rapal 200

Art.-No.: 3.94844 P



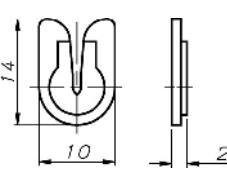
Mat: Rapal 200 PI

Art.-No.: 3.94656 PIP



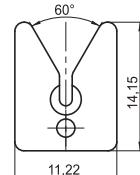
Mat: Rapal 200 PI

Art.-No.: 3.94657 PIP



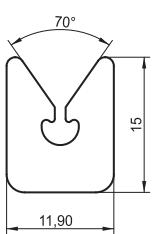
Mat: Rapal 200

Art.-No.: 3.94655 P



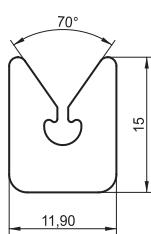
Mat: Titania

Art.-No.: 3.90367 GP



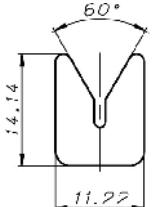
Mat: Rapal

Art.-No.: 3.90368



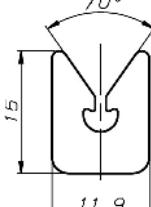
Mat: Titania

Art.-No.: 3.90368 GP



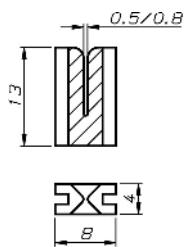
Mat: Rapal 200 AZ

Art.-No.: 3.90125 AZP



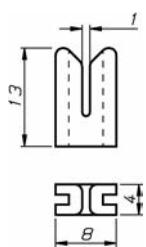
Mat: Rapal 200 AZ

Art.-No.: 3.90124 AZP



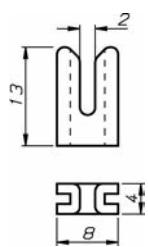
Mat: Rapal 100

Art.-No.: 3.94016



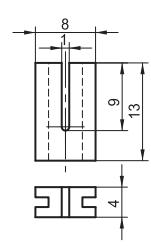
Mat: Rapal 100

Art.-No.: 3.94120



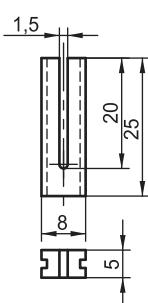
Mat: Rapal 100

Art.-No.: 3.94123



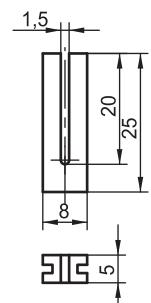
Mat: Rapal 100

Art.-No.: 3.16672



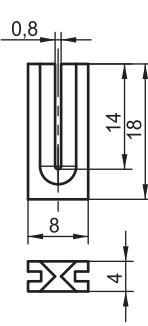
Mat: Rapal 100

Art.-No.: 3.16692



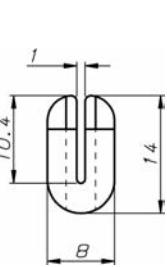
Mat: Rapal 100

Art.-No.: 3.90051



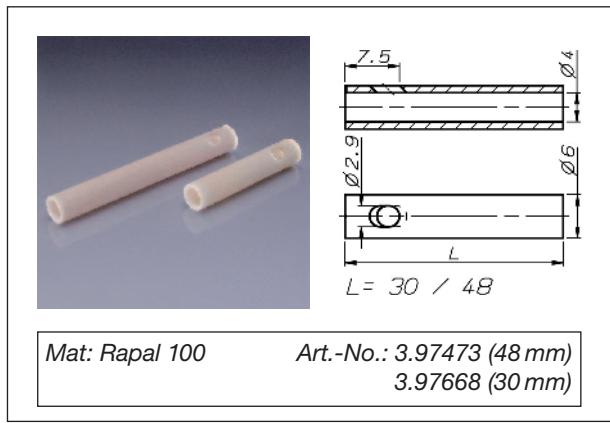
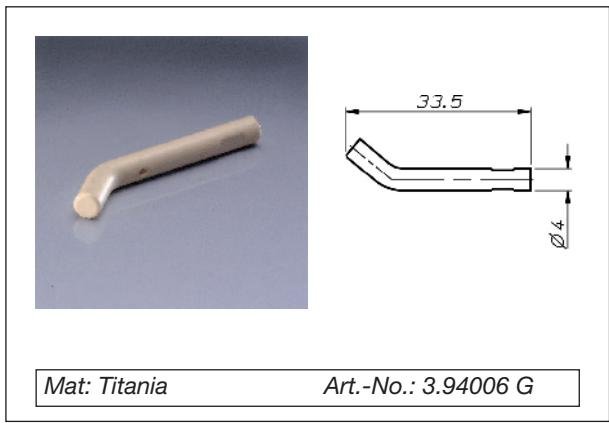
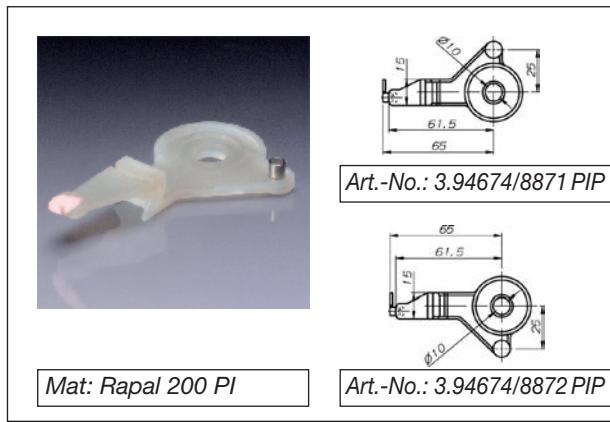
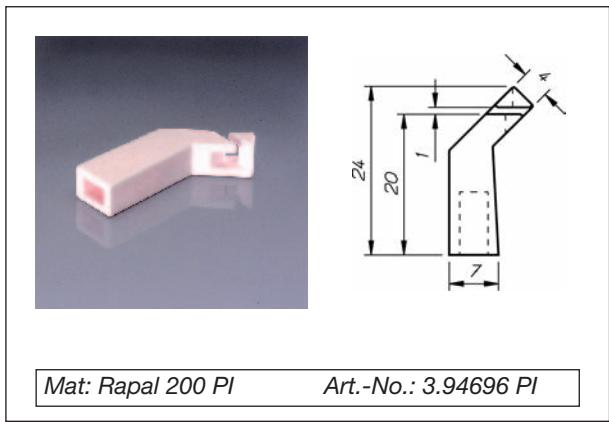
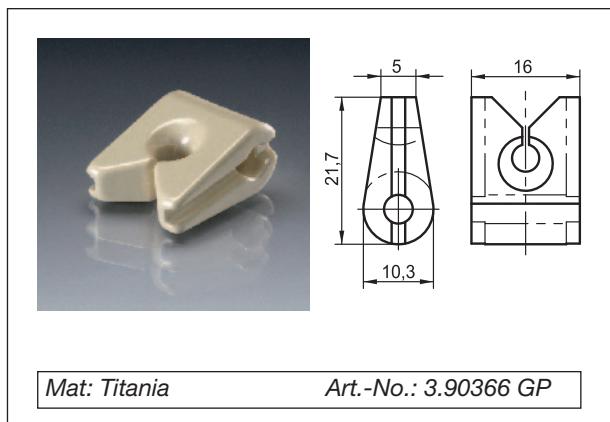
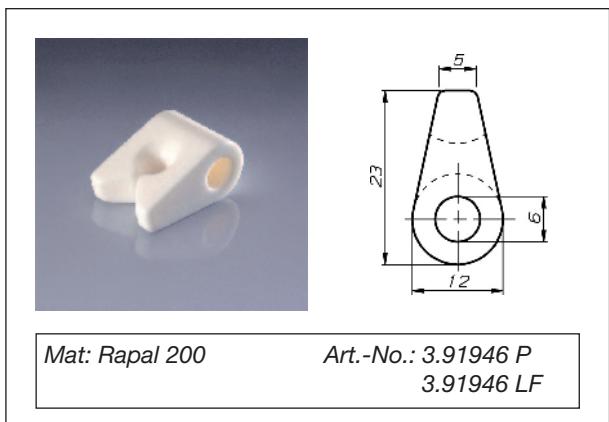
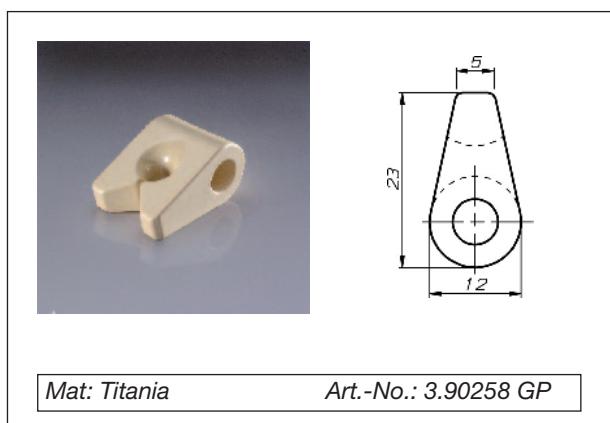
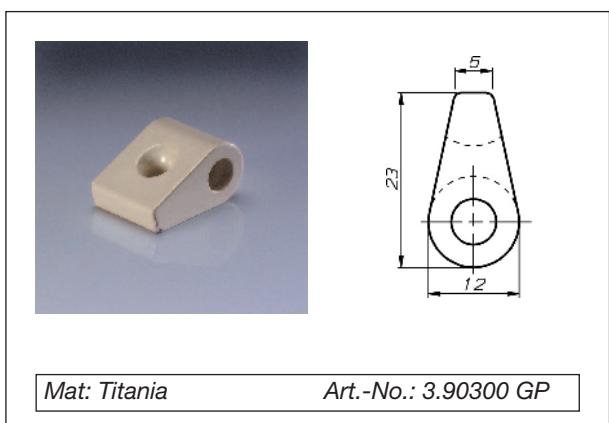
Mat: Rapal 100

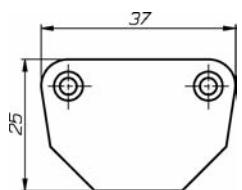
Art.-No.: 3.94028



Mat: Rapal 100

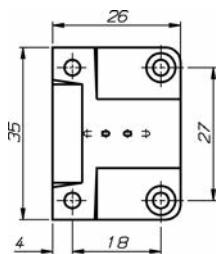
Art.-No.: 3.9303





Mat: Rapal 100 R

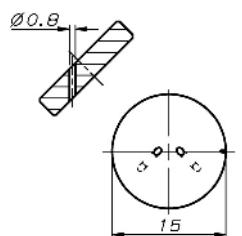
Art.-No.: 3.90174 R



Mat: Rapal 100

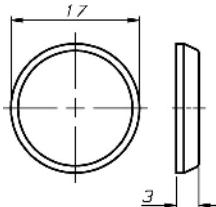
Art.-No.: 3.90173

Diameter of bore: 0,8 / 0,9 / 1,0 / 1,3



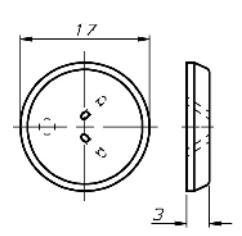
Mat: Rapal 200

Art.-No.: 3.90211



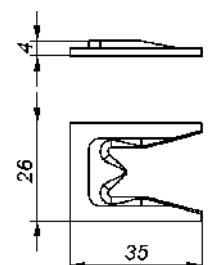
Mat: Rapal 200

Art.-No.: 3.90180



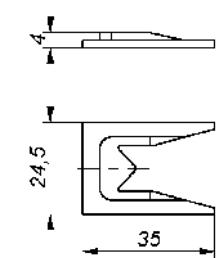
Mat: Rapal 200

Art.-No.: 3.90151



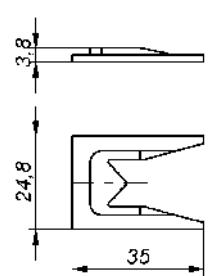
Mat: Rapal 200 PIP

Art.-No.: 3.94650 PIP



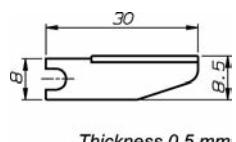
Mat: Rapal 200 AZ

Art.-No.: 3.94807 AZP



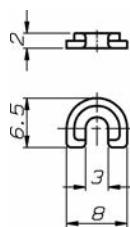
Mat: Titania

Art.-No.: 3.94808 GP



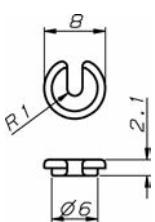
Mat: Zirconia Y

Art.-No.: 3.30104



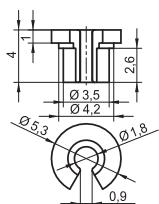
Mat: Rapal 200

Art.-No.: 3.94707



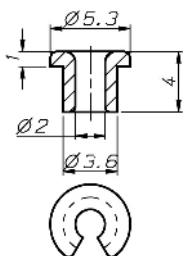
Mat: Rapal 100 R

Art.-No.: 3.94055 R



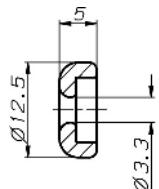
Mat: Titania

Art.-No.: 3.94842 G



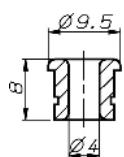
Mat: Titania

Art.-No.: 3.94124 GP



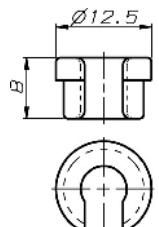
Mat: Titania

Art.-No.: 3.90004 G



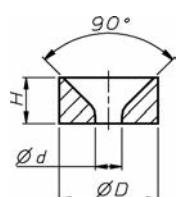
Mat: Rapal 100 R

Art.-No.: 3.91823 R



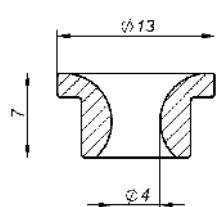
Mat: Rapal 100

Art.-No.: 3.91713



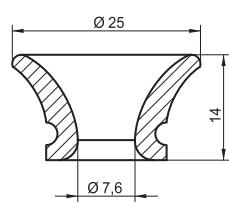
Art.-Nr.	D	d	H
3.90085	13	4,5	6
3.91721	13	3,5	6
3.90140	13	5,5	6

Mat: Rapal 200



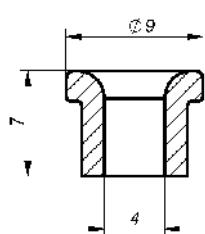
Mat: Titania C

Art.-No.: 3.90337 SP



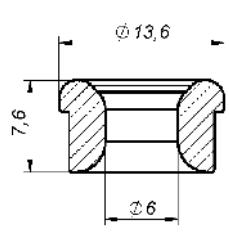
Mat: Titania C

Art.-No.: 3.90532/7.6 SP



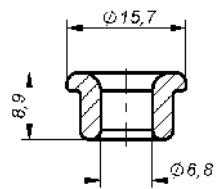
Mat: Titania C

Art.-No.: 3.90378 SP



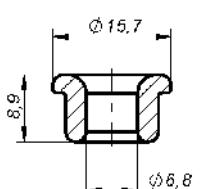
Mat: Rapal

Art.-No.: 3.90347 P



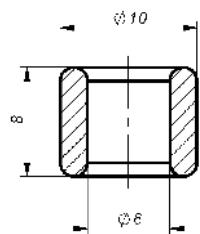
Mat: Titania C

Art.-No.: 3.90380 SP



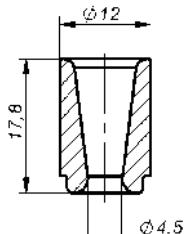
Mat: Titania

Art.-No.: 3.90380 GP



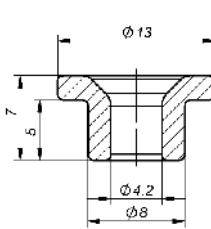
Mat: Rapal 200 AZ

Art.-No.: 3.90364 AZ



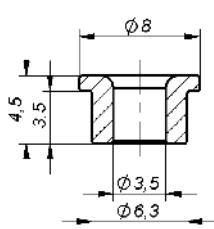
Mat: Titania

Art.-No.: 3.90338 GP



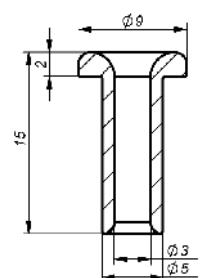
Mat: Rapal 200

Art.-No.: 3.99003



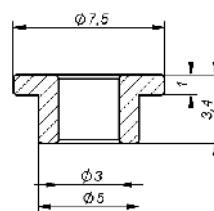
Mat: Rapal 200

Art.-No.: 3.99004



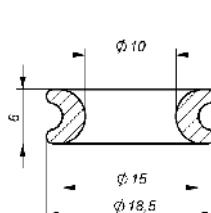
Mat: Titania C

Art.-No.: 3.90412 SP



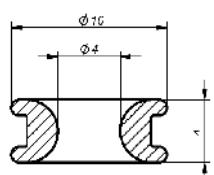
Mat: Rapal 200 PI

Art.-No.: 3.90047/3,4 PI



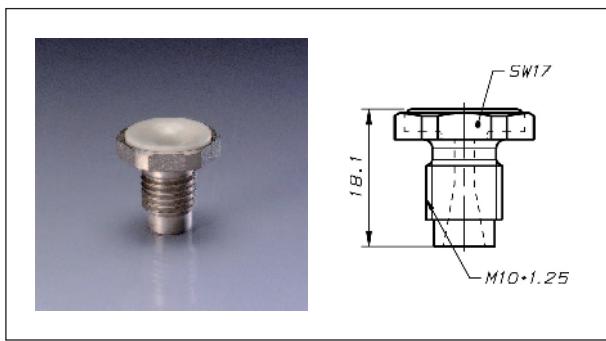
Mat: Rapal 100

Art.-No.: 3.90119 P

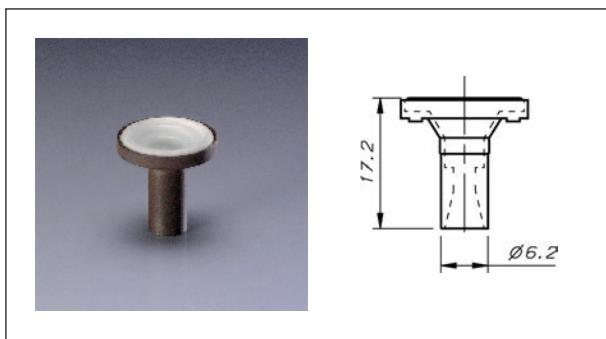


Mat: Titania

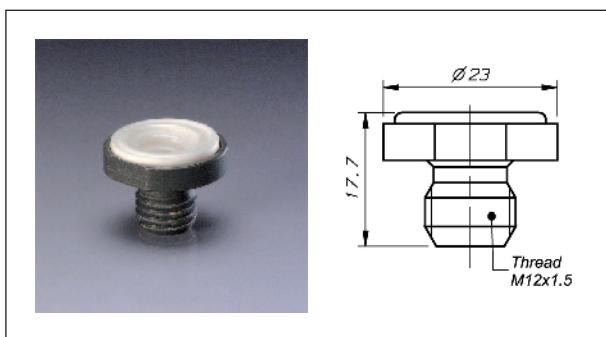
Art.-No.: 3.90416 GP



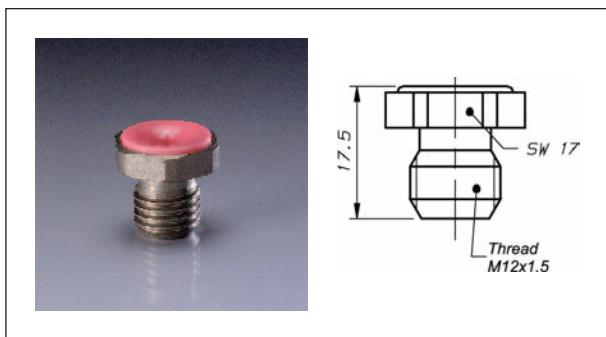
3.91989/8907 P	KN	white	
3.90076/8907 P	KN 3	white	
3.91988/8907 PIP	KN 4	pink	wide grooves
3.94709/8907 PIP	KN 4	pink	narrow grooves
3.94699/8907 P	KN 6	white	
3.91759/8907 P	KN 8	white	
3.94582/8904 P	KS	white	



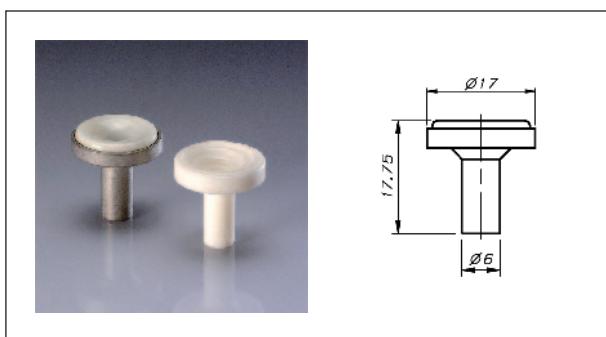
3.94781/8929 P	KN 6	white	
3.94722/8929 PIP	KN 4	pink	
3.94730/8929 P	KN 8	white	
3.94729/8929 P	KN	white	
3.94732/8930 P	KS	white	



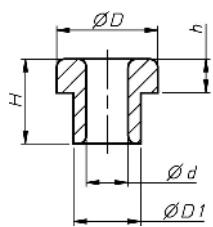
3.94583/8922 P	KS	white	
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3.91989/8920 P	KN	white	
3.90076/8920 P	KN 3	white	
3.91988/8920 PIP	KN 4	pink	wide grooves
3.94709/8920 PIP	KN 4	pink	narrow grooves
3.91759/8920 P	KN 8	white	
3.94699/8920 P	KN 6	white	



3.91989/8919 P	KN	white	
3.90076/8919 P	KN 3	white	
3.91988/8919 PIP	KN 4	pink	wide grooves
3.94709/8919 PIP	KN 4	pink	narrow grooves
3.91759/8919 P	KN 8	white	
3.94667 P	KS	white	all ceramic
3.94699/8919 P	KN 6	white	

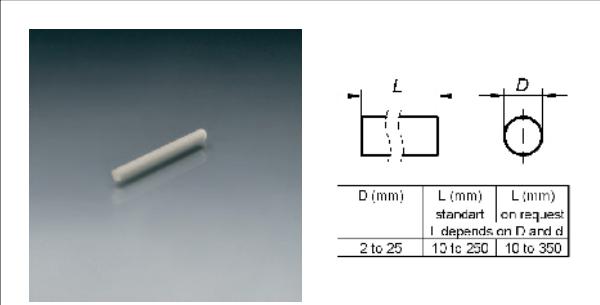


Mat: Rapal 100

**Further dimensions  
on request**

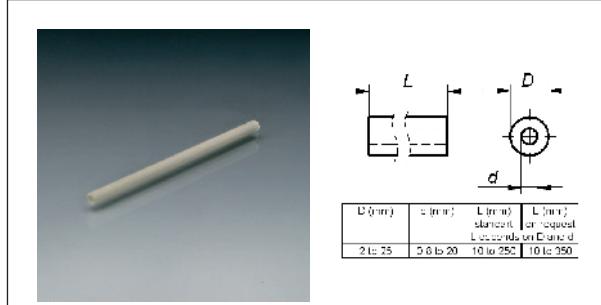
## **Eyelets**

<b>Article:</b>	<b>Material:</b>	<b>Colour:</b>	<b>Surface:</b>	<b>Dimensions:</b>				
				<b>D</b>	<b>D1</b>	<b>d</b>	<b>H</b>	<b>h</b>
<b>3.90047/3,4 PI</b>	Rapal 100	pink	as fired	7,50	5,00	3,00	3,40	1,00
<b>3.90047/5,0 PI</b>	Rapal 100	pink	as fired	7,50	5,00	3,00	5,00	1,00
<b>3.90047/6,3 PI</b>	Rapal 100	pink	as fired	7,50	5,00	3,00	6,30	1,00
<b>3.90079</b>	Rapal 100	white	as fired	8,00	6,00	3,00	6,00	2,00
<b>3.90103</b>	Rapal 100	white	as fired	8,00	6,00	3,00	7,00	2,00
<b>3.90103 P</b>	Rapal 100	white	polished	8,00	6,00	3,00	7,00	2,00
<b>3.90136</b>	Rapal 100	white	as fired	9,70	7,70	4,20	12,00	2,00
<b>3.90146</b>	Rapal 100	white	as fired	17,00	12,00	7,50	14,00	5,50
<b>3.90153</b>	Rapal 100	white	as fired	10,50	7,50	4,00	8,50	2,00
<b>3.90166</b>	Rapal 100	white	as fired	15,00	13,00	9,00	10,00	1,50
<b>3.91638</b>	Rapal 100	white	as fired	20,80	19,20	13,70	9,20	2,20
<b>3.91671</b>	Rapal 100	white	as fired	12,50	10,50	6,00	8,00	3,00
<b>3.91672</b>	Rapal 100	white	as fired	12,00	8,00	5,00	10,00	4,00
<b>3.91672 P</b>	Rapal 100	white	polished	12,00	8,00	5,00	10,00	4,00
<b>3.91678</b>	Rapal 100	white	as fired	9,00	7,00	6,00	7,00	2,00
<b>3.91691 P</b>	Rapal 100	white	polished	7,80	6,20	3,20	2,60	1,00
<b>3.91694</b>	Rapal 100	white	as fired	5,50	4,00	2,00	6,50	1,50
<b>3.91740</b>	Rapal 100	white	as fired	8,50	7,50	5,00	2,90	0,90
<b>3.91775</b>	Rapal 100	white	as fired	7,80	6,20	3,20	4,50	1,00
<b>3.91775 P</b>	Rapal 100	white	polished	7,80	6,20	3,20	4,50	1,00
<b>3.91776</b>	Rapal 100	white	as fired	7,80	6,00	3,50	6,00	1,00
<b>3.91776 R</b>	Rapal 100	red	as fired	7,80	6,00	3,50	6,00	1,00
<b>3.91779</b>	Rapal 100	white	as fired	12,00	10,00	4,00	15,00	4,00
<b>3.91797 R</b>	Rapal 100	red	as fired	5,50	4,00	1,50	5,50	1,50
<b>3.91807</b>	Rapal 100	white	as fired	7,80	6,00	3,20	3,40	1,00
<b>3.91822</b>	Rapal 100	white	as fired	31,75	26,30	19,05	19,80	6,35
<b>3.91883</b>	Rapal 100	white	as fired	13,00	11,00	7,00	6,00	1,50
<b>3.91939</b>	Rapal 100	white	as fired	12,00	10,00	5,50	9,00	2,00
<b>3.94036</b>	Rapal 100	white	as fired	5,30	3,60	2,00	4,00	1,00
<b>3.94160</b>	Rapal 100	white	as fired	6,60	4,80	3,60	4,00	1,00
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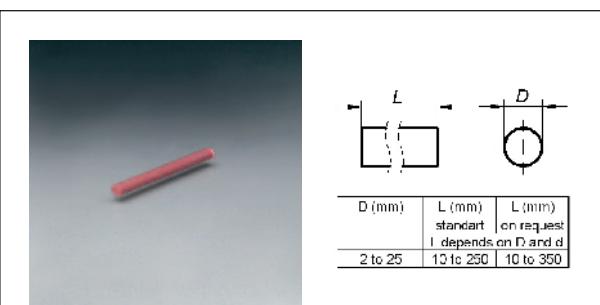
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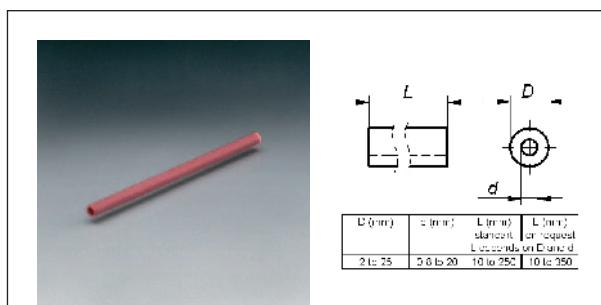
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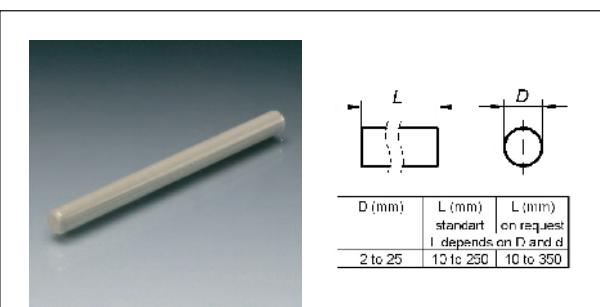
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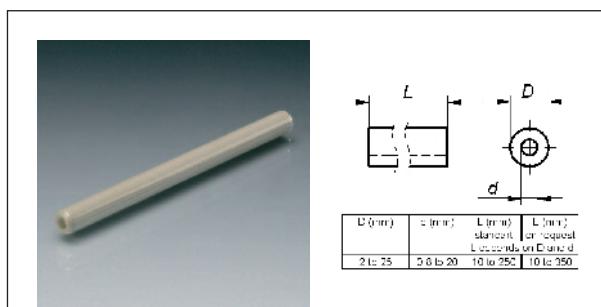
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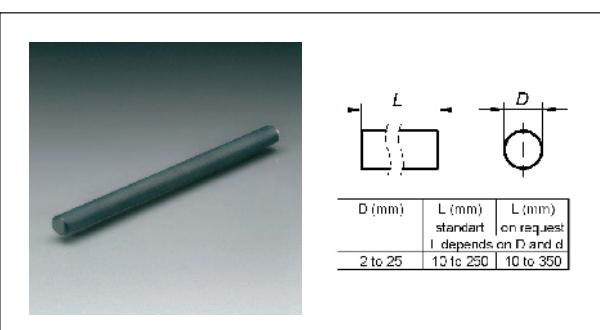
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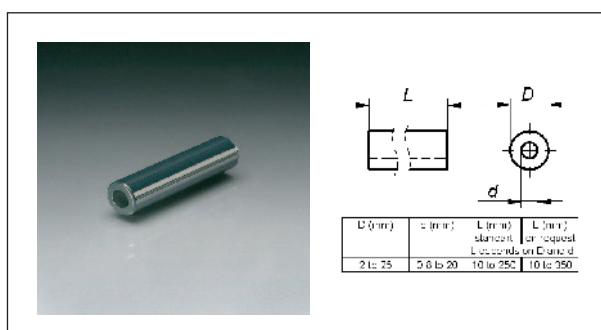
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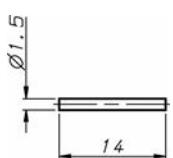
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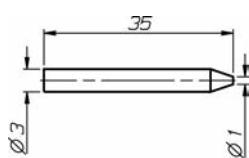
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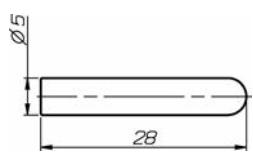
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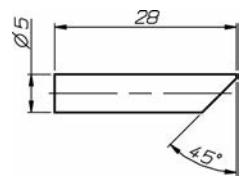
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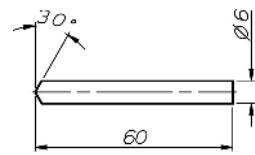
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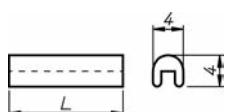
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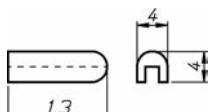
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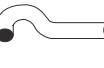
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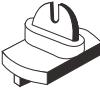
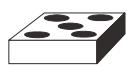
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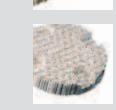
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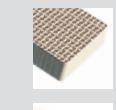
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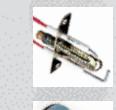
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