

Card Clothing  
for Nonwoven



# Nonwoven

Card clothing

No limits in processing fibers



### **High level of reliable manufacturing processes**

Graf is the world's leading supplier of clothing for carding and combs for combing machines in the short- and long-staple spinning industry, as well as for producers and machine builders for nonwovens. The company's core competency lies in its ability to process textile fibers of any kind, using the precise processing of steels and elastomers to manufacture high-tech components like metallic clothing for roller- and flat cards.

Working from five manufacturing locations worldwide, Graf's high level of vertical integration and local support helps customers achieve superior quality and performance across the full spectrum of fiber processing. Graf + Cie AG, headquartered in Rapperswil (Switzerland), is a subsidiary of the Rieter Group.

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# Roller Card Clothing

The superior performance of Graf's innovative card clothing for roller cards can boost the production rates with a significantly higher throughput and greater carding efficiency compared to conventional clothing. Graf clothing also ensures consistently high web quality. From hygiene articles to noise insulation products, it is a solution that can enhance the production of any man-made fiber in the nonwoven sector.

## Challenges and solutions ahead

The biggest challenge nonwoven manufacturers face is the ability to obtain consistent quality for a wide range of raw materials without compromising throughput and process stability. With Graf's nonwoven solution – when clothing is adjusted perfectly, and machine conditions are optimized in line with the raw materials and output – configurations can be guaranteed for any application regardless of fiber type, web weight and end product. The unmatched flexibility and agility of our metallic card clothing, therefore, gives customers an enviable advantage in a market poised for healthy growth over the coming years.

The precise fiber transfer to and from the cylinder with Graf metallic card clothing brings optimal processing

with significantly fewer failures compared to other card clothing solutions. Continuously high process stability provides web quality that consistently replicates across any application throughout the entire lifetime of the clothing.

Graf clothing is produced to the highest quality level and brings an unrivaled depth to vertical integration, irrespective of the machine manufacturer. In collaboration with customers, Graf is continuously improving the carding and mixing of fibers through the research and development process. This ensures that Graf metallic card clothing for roller cards is optimized for real applications in the processing of any fiber type and web weights.



# Key Components of the Roller Card

## Graf recommends using interlinked clothing:

- in the working angle section of the roller card and
- for safety reasons, particularly for large working widths and for processing long and coarse man-made fibers.

## Graf recommends Hipro clothing:

- on the following rollers: doffers, workers, strippers and condenser rollers and
- for the highest performance and precision with an exceptionally long lifetime of standard profiles and interlinked clothing.

## Feed rollers, feed roller cleaning rollers and pre-opening rollers

Graf recommends the use of interlinked clothing for these rollers. Grooved rollers can be trued off for the installation of interlinked clothing.

## Cylinders and doffers

Graf manufactures optimized clothing for each type of fiber. The clothing is continuously adapted to the latest technological knowledge. Cylinder wires used for the fine fiber and recycling area are available in special steel alloys.

## Workers and strippers

Specially designed worker clothing with increased fiber adhesion is available for processing man-made, natural and difficult fibers.

## Transfer rollers

The transfer roller clothing must be aggressive and sturdy to ensure the correct transport of the fibers.

## Random rollers

Clothing on random rollers is subject to increased wear. Therefore, Graf also manufactures the clothing in the special steel alloy CUTTYSHARP. With the CUTTYSHARP alloy, the lifetime of the random roller clothing can be increased by up to 30%.

## Condenser rollers

Impeccable running properties are achieved with special shapes and specially polished surfaces.

## Take-off rollers

There is no use in being able to produce the best web on the roller card if the quality cannot be maintained when the material is removed from the machine.

The Graf take-off roller clothing is the best in the market to take-off the web from the last cylinder, doffer or condenser of the roller card.

## Unique web uniformity

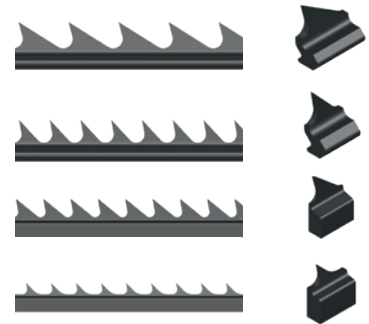
The consistent web quality is ensured by the Swiss-engineered geometry, PPSI selection and unique Needle Finish surface treatment in the market.

# General Information on Metallic Card Clothing

## Cylinder clothing

### Clothing height, working angle and density

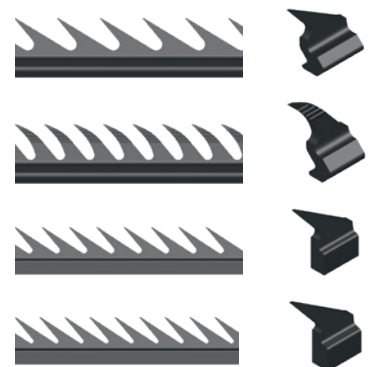
6.0 – 5.5 mm	For pre-rollers and breast cylinders in the fiber range > 40 dtex
5.0 mm	For pre-rollers and breast cylinders in the fiber range > 12 – 40 dtex
4.0 – 3.5 mm	For pre-rollers in the fiber range 6 – 12 dtex For main cylinders in the fiber range > 17 dtex
3.2 or 2.5 mm	For main cylinders in the fiber range > 1 – 17 dtex
10 – 20°	Depending on raw material specifications and roller diameters
32 – 550 p.p.s.i.	Depending on raw material specifications



## Doffer clothing

### Clothing height, working angle, density and shapes

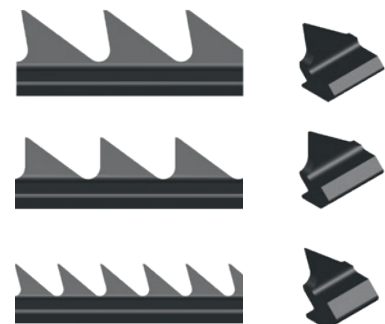
5.0 mm	For productions > 25 g/m <sup>2</sup> and for fibers > 8.8 dtex
4.0 mm	For productions > 25 g/m <sup>2</sup> and for fibers < 8.8 dtex
30 – 45°	Depending on raw material specifications
80 – 500 p.p.s.i.	Depending on raw material specifications
Clothing with lateral serration	Used for man-made fibers and blends, particularly for fibers with low adhesion, high production rates and heavy web weights
Clothing with beakshape serration	For processing very voluminous, siliconized raw fiber material or other fiber material that is hard to grip (high crimp)
Clothing with arched tooth shape	Large capacity to retain fibers, sturdy teeth, good fiber adhesion



## Licker-in clothing

### Clothing height, working angle and density

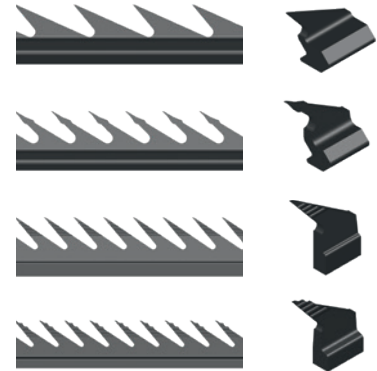
7.5 – 5.0 mm	For universal application
0 – 25°	Depending on raw material specifications and roller diameters
21 – 80 p.p.s.i.	Depending on raw material specifications



## Worker clothing

### Clothing height, working angle, density and shapes

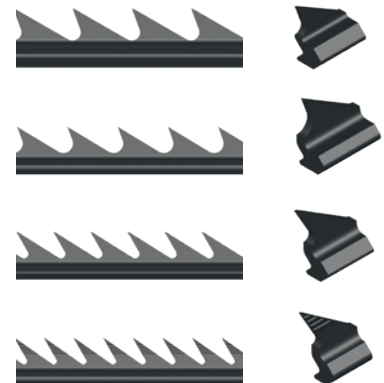
5.0 mm	For productions > 25 g/m <sup>2</sup> and for fibers > 8.8 dtex
4.0 mm	For fibers < 8.8 dtex
30 – 45°	Depending on raw material specifications
50 – 500 p.p.s.i.	Depending on raw material specifications and roller diameters
Shapes	Depending on raw material specifications



## Stripper clothing

### Clothing height, working angle, density and special features

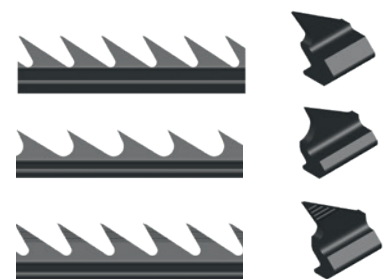
6.0 – 5.5 mm	For strippers on pre-rollers and breast cylinders
5.0 mm	For strippers on pre-rollers and breast cylinders
4.0 – 3.2 mm	For strippers on pre-rollers and breast cylinders
10 – 40°	For processing all fiber material and particularly voluminous and siliconized fibers or fiber material with poor adhesion and high delivery speed (= increased working angle). Serrated clothing is used for smooth and fine fibers and for high speeds.
32 – 300 p.p.s.i.	Depending on raw material specifications
Surface treatment	“Blank hardened” surface finish for fewer deposits of spinning agents of special fibers



## Clothing for transfer rollers

### Clothing height, working angle, density and shapes

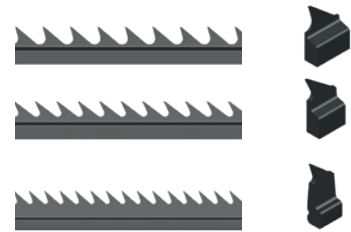
5.0 mm	Depending on the pre-roller and position within the roller card
4.0 mm	Depending on the pre-roller and position within the roller card
25 – 30°	Depending on raw material specifications
70 – 200 p.p.s.i.	Depending on raw material specifications
Clothing with lateral serration	Used for man-made fibers and blends, particularly for fibers with low adhesion and high production rates



## Random roller clothing

### Clothing height, working angle, density and special features

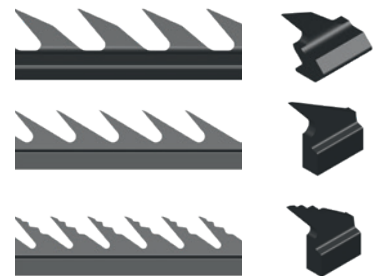
3.3 – 2.5 mm	Depending on raw material specifications
10 – 25°	Depending on raw material specifications
300 – 550 p.p.s.i.	Depending on raw material specifications
Special alloy	Increase in lifetime by up to 30 % with CUTTYSHARP alloy
Surface treatment	Possible for some specifications; shorter and optimized running-in period with “blank hardened” surface finish



## Condenser roller clothing

### Clothing height, working angle, density and special features

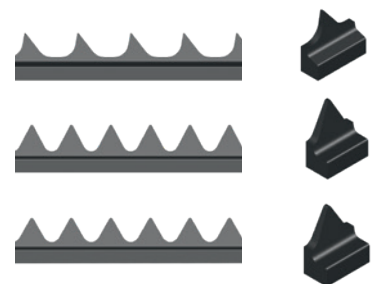
4.0 – 6.0 mm	Depending on raw materials specifications and production
40 – 45°	Depending on raw materials specifications and production
47 – 170 p.p.s.i.	Depending on raw materials specifications
Surface treatment	Possible for some specifications; shorter and optimized running-in period as well as cleaner clothing with “blank hardened” surface finish



## Take-off roller clothing

### Clothing height, working angle, density and special features

4.0 – 3.5 mm	Standard heights
28° negative to 40° negative	Depending on raw material specifications
90 – 210 p.p.s.i.	Depending on raw material specifications
Surface treatment	Also available with Polidur or Needle Finish treatment





# Surface Treatments and Steel Alloys

## Surface treatments

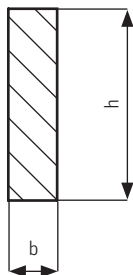
Depending on the fiber material, a choice of surface finishes are available.

Surface finishes	Characteristics
Blank disc polished (BLD)	Mechanical treatment for smoothing and refining the clothing surfaces, minimal running-in time, consistently high quality right from the start.
Blank hardened (BLH)	Treated clothing with scale-free surface.
Needle Finish (NF)	Electrochemical polishing and rounding of all edges on the clothing teeth for special applications.
Polidur treatment (POL)	Improved surface finish achieved with electrochemical polishing. The clothing is completely de-burred at the same time.

## Border wires

The selection of the border wire for attaching the clothing depends on the groove width and height of the clothing. Graf offers the following types of border wire:

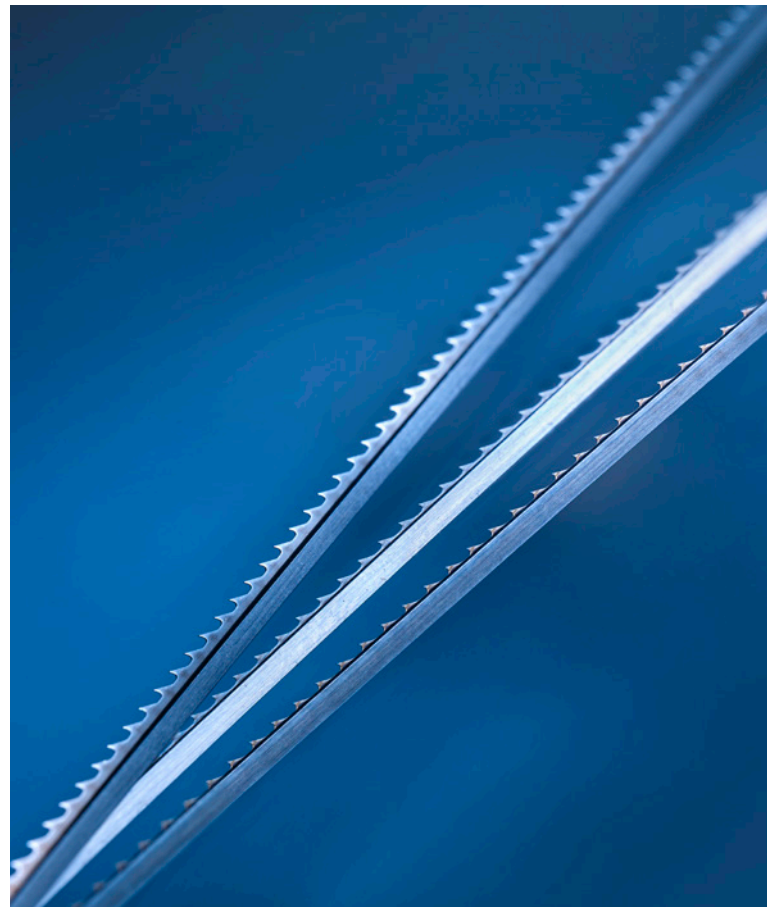
I form		
Type	h	b
RI-4,5 x 1,5	4.50	1.50
RI-4,5 x 2,0	4.50	2.00
RI-6,0 x 2,0	6.00	2.00
RI-6,5 x 1,5	6.50	1.50



## Steel alloys

Depending on the application and demand, GRAF can supply various alloys. Different steel alloys can be used, depending on the clothing type and area of application.

Type	Characteristics
CUTTYSHARP (CS)	For the highest demands and lifetimes for cylinder clothing and random rollers.
HIGH TECH (HT)	Steel alloy with special additives. Substantially increased lifetimes compared to conventional clothing.
GTHREE (GT)	Steel alloy is characterized by particularly high toughness.



# Applications and Specifications at a Glance

Thanks to innovative geometry, excellent material and first-class processing, Hipro metallic card clothing ensures top performance and precision. They can be used on high-performance roller card systems as well as on conventional machines.

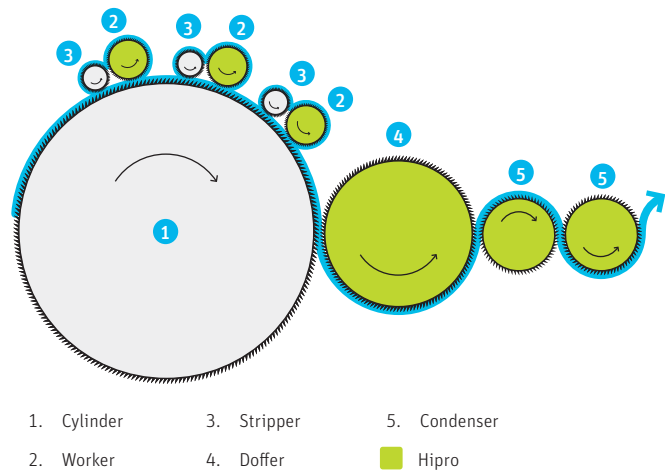
## The secret of Hipro

Significantly increased fiber retention thanks to a specially designed hump at the front side of the teeth.

## Range of applications

End products for segments such as hygiene, medical, automotive, filtration, floor coverings, etc. Both high-performance and conventional cards can be preferably equipped with the Hipro card clothing.

Hipro guarantees no limits in fiber types and web weights (except brittle fibers).



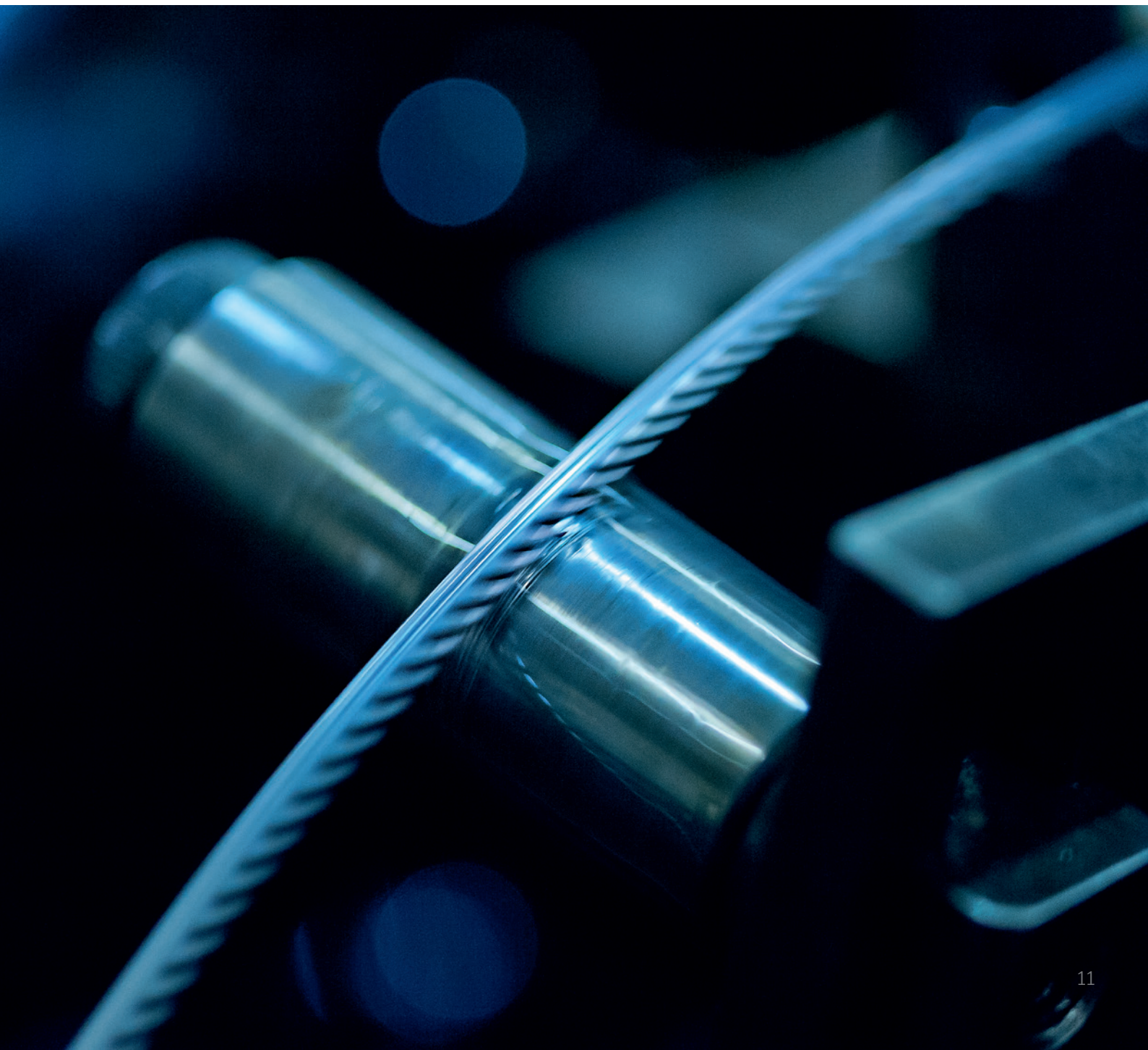
Hipro metallic card clothing. Innovative tooth design for efficient processes on roller cards.

With Hipro clothing a significantly increased fiber retention can be reached thanks to a specially designed hump at the front of the teeth. Hipro can be used on the following rollers: worker, doffer and condenser. These excellent, robust clothing are available with standard profile and as interlinked clothing.

Overview of the most popular Hipro metallic card clothing			
Main use	Geometry	Points per square inch (PPSI)	Type
<b>Worker</b> The aggressive tooth shape provides the best carding effects between cylinder and worker.		95	V F 50 +45 16 HT BLD
		129	V H 50 +45 16 HT BLD
		258	K 50 +45 1 X1,0 GT BLH
		338	M 40 +40 5 X0,9 GT BLD
<b>Doffer</b> The arched tooth shape allows the smoothest fiber placement along the doffer teeth.		215	V K 50 +45 20 HT
		258	K 50 +45 X1,0 GT BLD
		286	K 40 +45 3 X0,9 GT BLH
		338	M 40 +45 X0,9 GT BLD
<b>Condenser</b> Additional humps provide extra compression to optimize the web weight increase.		147	H 50 +45 2 X1,4 HT BLD
		147	H 50 +45 3 X1,4 HT BLD
		172	H 50 +45 2 X1,2 HT BLD
		172	H 50 +45 3 X1,2 HT BLD

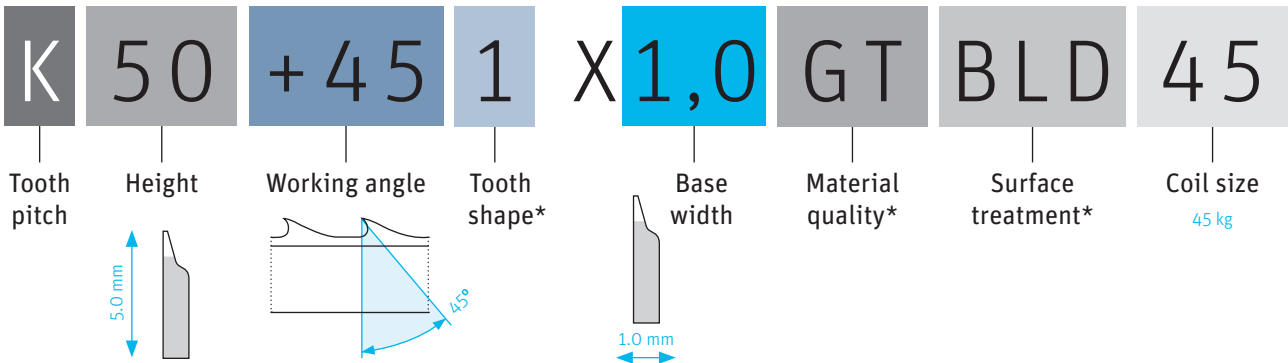
## Highest precision and carding efficiency

The superior performance of Graf's Swiss Engineered card clothing for roller cards can boost the production rates with a significantly higher throughput and greater carding efficiency compared to conventional clothing.

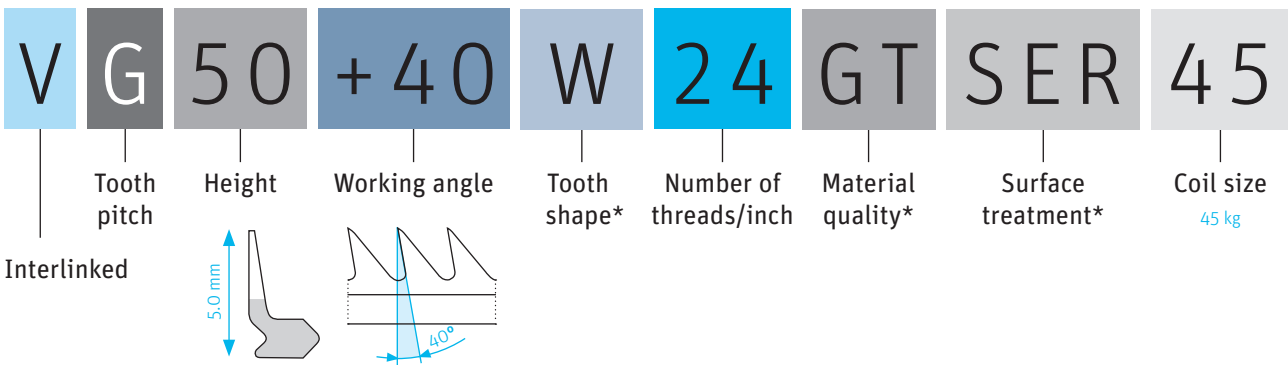


# Graf Identification Code for Metallic Card Clothing

## Standard profiles



## Interlinked profiles



### \*Tooth shapes

B = arched tooth shape

F = flat tooth

G = beak-shaped tooth

S = special cut depth

W = execution with humps

blank = standard tooth shape

1 – 9 = special tooth shape or version



### \*Surface treatments

BLD = blank disc polished

BLH = blank hardened

NF = Needle Finish

POL = polidur

SER = serrated profile

SER BLD = serrated profile + blank disc polished

SER BLH = serrated profile + blank hardened

SER NF = serrated profile + Needle Finish

SER POL = serrated profile + polidur

### \*Material qualities

GT = G Three

HT = High Tech

CS = CUTTYSHARP

MS = MULTISHARP

## Examples for points per square inch (p.p.s.i.)

Standard profiles	p.p.s.i.
G2 40 -28 1 X1,8 GT NF	107
O 32 +15 X0,9 CS BLD	395
K 50 +40 X0,9 GT SER BLD	287
T2 33 +15 X0,9 CS BLD	550
G 50 +40 G X1,2 GT BLD	148
HD2 34 +50 M X1,2 HT	variable

Interlinked profiles	p.p.s.i.
V D 50 +10 8 GT	32
V K 50 +40 W 20 GT SER BLD	215
V G 50 +30 20 GT BLD	148

Calculation example for O 32 +15 X0,9 CS BLD

$$395 \text{ p.p.s.i.} = \frac{645}{(25.4 \times 25.4) \times 0,9 \times 1,813}$$

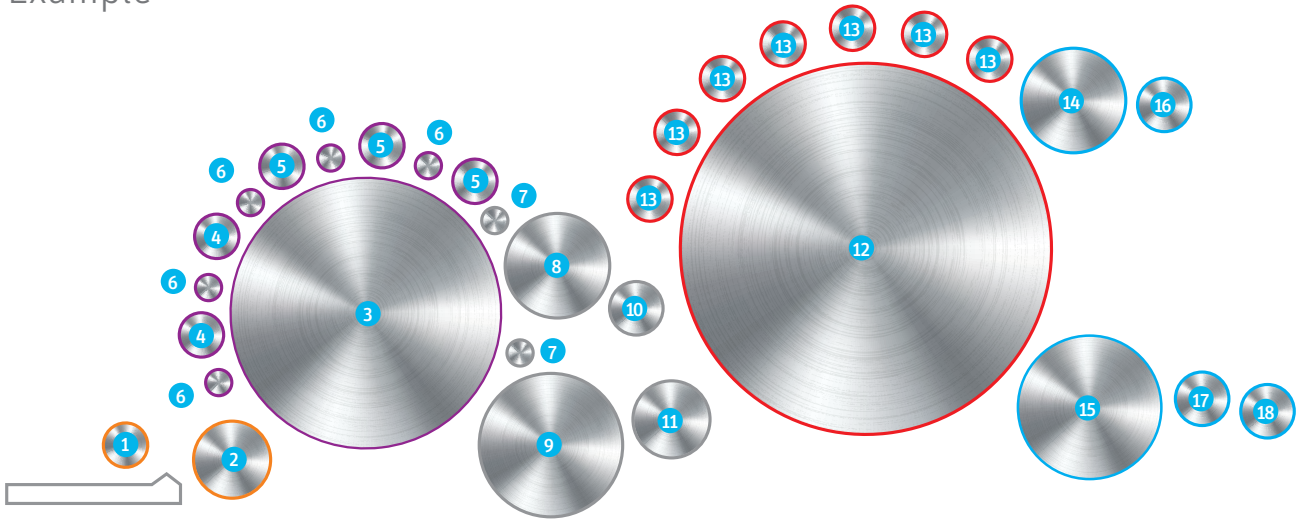
(Base width in mm x tooth pitch in mm)

No. of threads/inch	Base width in mm
6	4.20
8	3.17
10	2.54
12	2.10
14	1.80
16	1.60
18	1.40
20	1.20
24	1.00
28	0.90
32	0.80

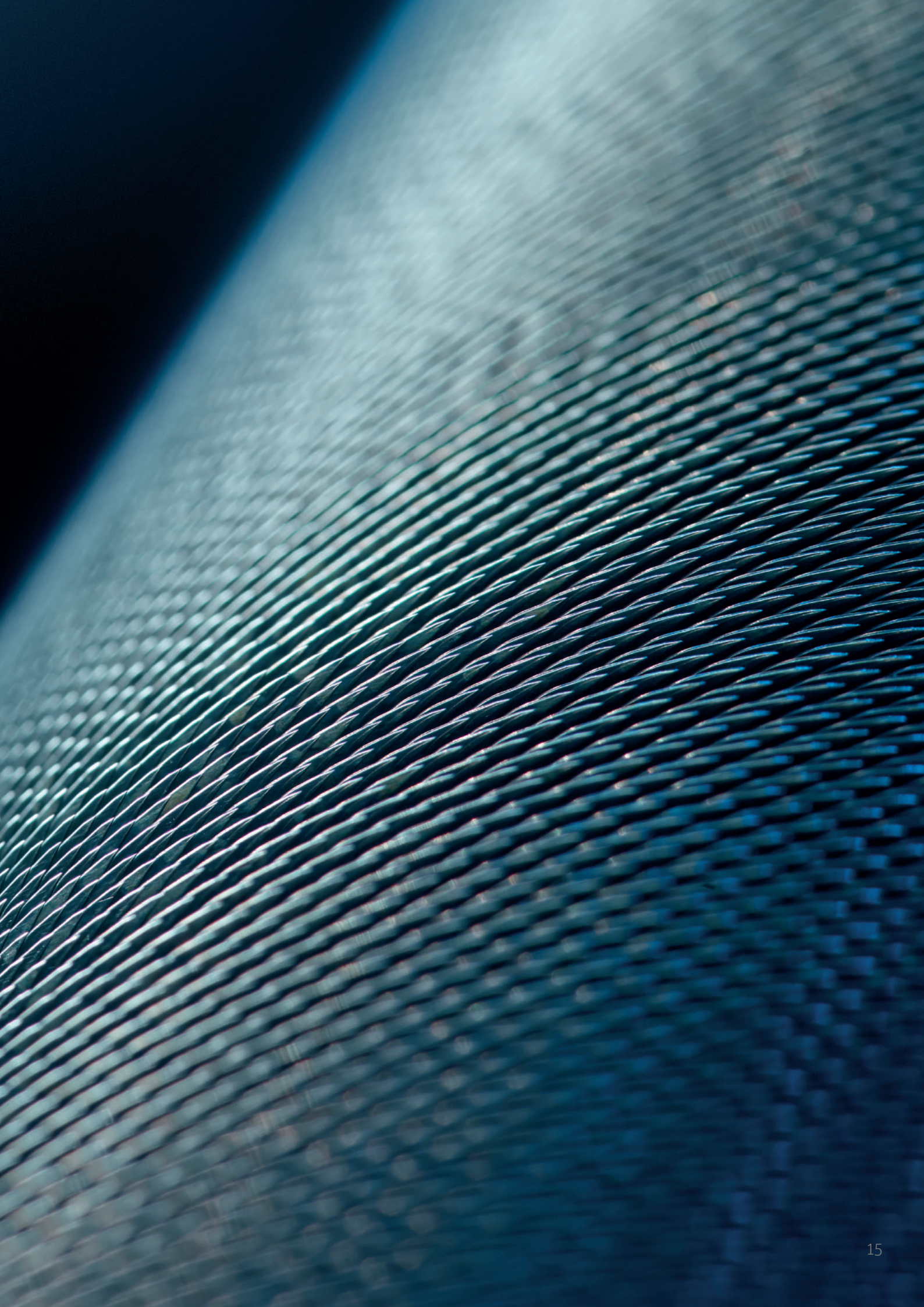
Pitch	Teeth/linear inch approx.	Pitch in mm
A1	1.25	20.024
A2	1.50	15.050
A3	1.75	14.930
B	2.00	12.727
B1	2.25	11.000
B2	2.50	10.012
B3	2.75	9.387
C	3.00	8.485
C1	3.25	8.000
C2	3.50	7.255
C3	3.75	6.953
D	4.00	6.364
D1	4.25	5.867
D2	4.50	5.442
D3	4.75	5.200
E	5.00	5.006
E2	5.50	4.470
F	6.00	4.242
F2	6.50	3.911
G	7.00	3.627
G2	7.50	3.337
H	8.00	3.129
H2	8.50	2.980
J	9.00	2.828
J2	9.50	2.607
K	10.00	2.502
L	11.00	2.317
M	12.00	2.121
N	13.00	1.956
O	14.00	1.813
P	15.00	1.669
R	17.00	1.490
T2	19.50	1.303

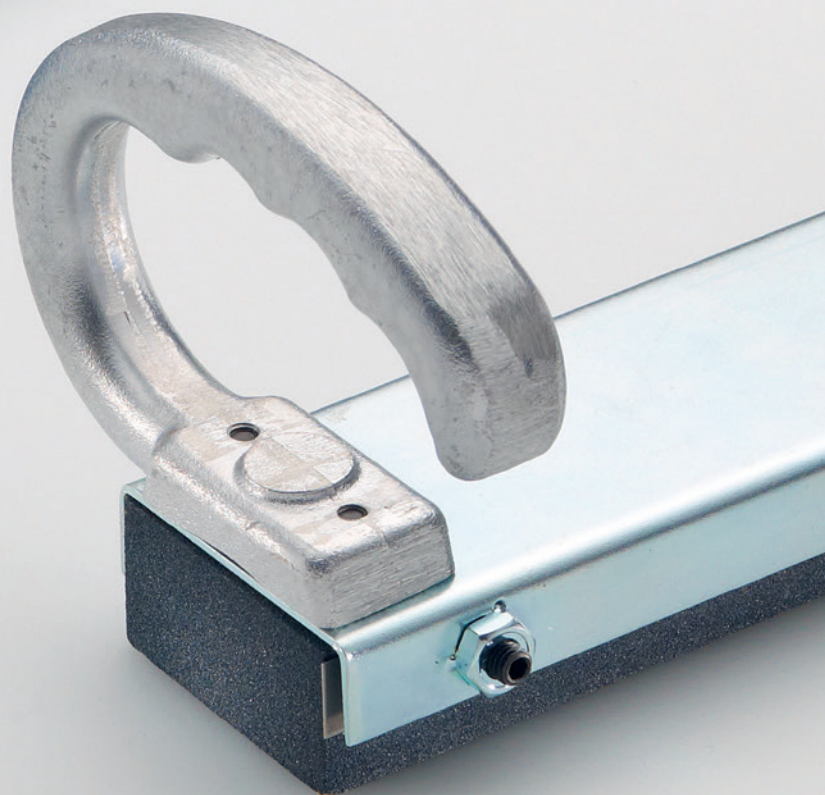
# Roller Card Configuration

## Example



Position	Roller	Clothing	Tooth pitch in mm	Height in mm	Working angle in °	Base width in mm	p.p.s.i.
1	Feed roller	V F 50 +15 12 GT	4.24	5.00	15	2.10	72
2	Licker-in	V D 50 +20 10 GT	6.36	5.00	20	3.17	32
3	Pre-roller	V H 40 +15 20 GT	3.13	4.00	15	1.20	172
4	Worker/Pre-roller	V G 50 +40 20 GT SER	3.63	5.00	40	1.20	148
5	Worker/Pre-roller	V H 50 +40 G 20 GT SER	3.13	5.00	40	1.20	172
6	Stripper/Pre-roller	V G 40 +40 20 GT	3.63	4.00	40	1.20	148
7	Condensers	V G 40 +30 16 GT	3.63	4.00	30	1.60	111
8	1st top doffer	V G 50 +40 W 24 GT SER	3.63	5.00	40	1.00	178
9	1st bottom doffer	V G 50 +40 W 24 GT SER	3.63	5.00	40	1.00	178
10	Top transfer roller	V G 50 +30 18 GT BLD	3.63	5.00	30	1.40	127
11	Bottom transfer roller	V G 50 +30 18 GT BLD	3.63	5.00	30	1.40	127
12	Cylinder	V J2 32 +15 28 HT	2.60	3.20	15	0.90	275
13	Worker	V F 37 -10 28 GT BLD	4.24	3.70	-10	0.90	168
14	Top doffer	K 40 +40 X0,85 GT SER	2.50	4.00	40	0.85	301
15	Bottom doffer	K 40 +40 X0,85 GT SER	2.50	4.00	40	0.85	301
16	Take-off roller	G2 40 -28 1 X1,8 GT NF	3.34	4.00	-28	1.80	107
17	Condenser	G 50 +40 G X1,2 GT BLD	3.63	5.00	40	1.20	148
18	Take-off roller	G2 40 -28 1 X1,8 GT NF	3.34	4.00	-28	1.80	107







# Accessories from a Single Source

Improved quality ensured by precise settings

A complete range for improved product quality. Optimal quality requires continuous checks and maintenance. Graf clothing is no exception. This is why Graf offers all the necessary tools, from the simple setting gauge through to special polishing systems. Accessories are available for the following areas: gauges, grinding, cleaning, polishing and microscope.

## Setting

Original Graf setting gauges are products of high technical precision to allow optimal carding quality. The setting gauges are designed to match the cards of various manufacturers.

### Eight-blade gauges

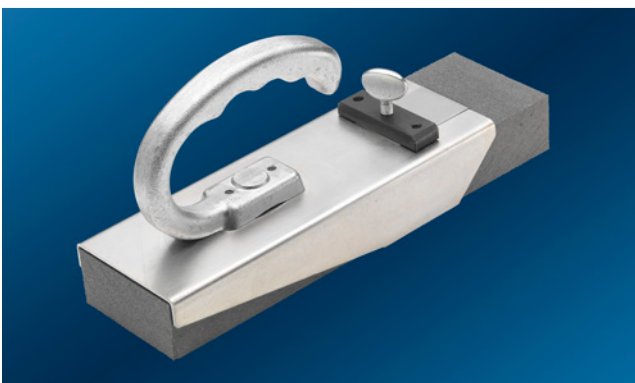


## Polishing and cleaning

The original Graf accessories for the polishing and cleaning of clothing are well-proven high-quality products that contribute to an excellent carding quality.

### Polishing sponge with holder

For the cleaning of newly mounted card clothing



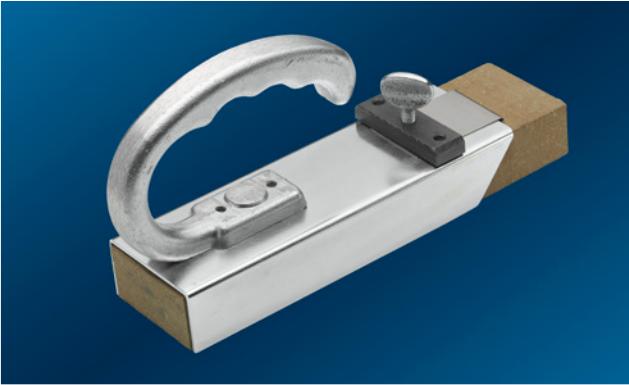
### Carborundum Hand grinding stone with holder

For equalizing newly mounted clothing and resharpening



**Miraclo  
Hand grinding stone with holder**

For repairing damaged clothing



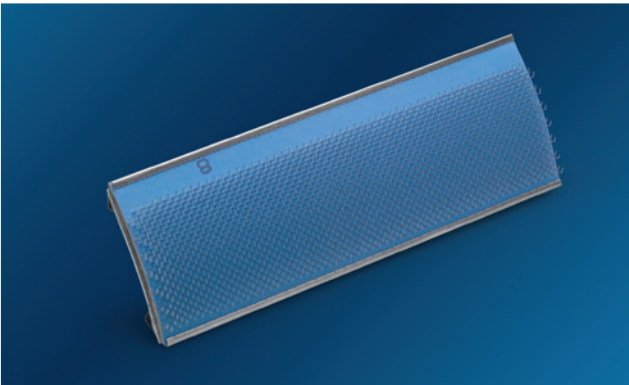
**Bronze or copper wire brush (with holder)**

For cleaning newly mounted or resharpened metallic card clothing



**Hand stripping card**

Replacement clothing for hand stripping cards without holder



**Hand stripping card with clamping device and curved or straight holder**

For general cleaning purposes



## Analysis

**WiFi digital Microscope**

With illumination, for precise analysis of clothing



# Worldwide Customer Support

Helping customers to maximize their carding investment

## Individual and sustainable solutions

Today's roller cards place the highest demands on the clothing and their maintenance. To ensure trouble-free operation in the nonwoven manufacturing plant, you can always call upon Graf's worldwide service network with our qualified service specialists. This considerably reduces downtimes and the resulting high costs.

Furthermore, the choice of the right clothing is of key importance to high productivity, quality and economic efficiency. The many facets involved in rollers and specific applications in the nonwoven industry requires experienced specialists.

Graf's qualified and long-term experienced technical consultants competently advise and support customers in selecting the application-specific clothing, and work closely with customers to develop a solution that aligns perfectly with their requirements and exceed their expectations.

### Highlights:

- 40 worldwide service stations enable on-site dismantling and fitting,
- short downtimes thanks to the use of experienced assembly and service teams,
- option for customers to manage inhouse or use Graf technical consultants and
- our competent support, combined with high-quality products make Graf the ideal fiber processing partner.



## Global service footprint – Graf supports customers worldwide





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