

**Precision feeler gauge strips**  
**Precision foils**  
**Special spring steel strips**  
**Non-ferrous metal foils**

**h+s**



## COMPETENCE, PRECISION AND SERVICES IN THE MANUFACTURE OF PRECISION FEELER GAUGE STRIPS AND METAL FOILS IS OUR STRENGTH.

### Innovative for more than 40 years

For more than 40 years, h+s Präzisionsfolien GmbH has been a competent and reliable supplier of precision feeler gauge strips and shims made of high-quality. All products are made of high-quality, hardened carbon steel, stainless steel and non-ferrous metals such as copper, brass, bronze, nickel and aluminium.

As a customer-oriented company, the range of products is constantly being expanded to include high-quality materials, so that more than 1100 different standard items in 24 different materials are available from stock.

The tried and tested portfolio is fully tailored to the needs of a wide variety of industries such as mechanical and plant engineering, automotive technology, aerospace, production companies and workshops.

We would be happy to advise you on all questions relating to material and quality and support you in optimizing your processes and products.

In addition to fast delivery of standard dimensions in large and small quantities as well as special dimensions and qualities

Furthermore, the company is specialized in the production of customer-specific precision laser cuts in all sizes and shapes.





### **Our new location**

In 2020, the move to a new company building in Vohenstrauß took place. In addition to a larger storage area for more raw material in standard dimensions, more space was also created for new sizes and alloys.

Several new machines are now available for the optimal production of special sizes

- new slitting line for a material width of max. 1250mm
- new cut-to-length for a material width of max. 1250mm
- New line for rewinding and edge processing up to width of 150mm
- New leveling and cut-to-length line for thin strips from 0.10mm thickness

As a future-oriented company, environmental protection and sustainability are among our corporate goals. Compliance with legal regulations and official requirements for environmental protection is a matter of course for us. By acting sustainably, we support the preservation of our planet's resources for the next generation. Reducing energy consumption is a major concern throughout the company. In addition to our own photovoltaic system, the new building also has an efficient heat pump with underfloor heating in our production areas, LED lighting in all areas and two charging stations for employees' and customers' electric cars. Modern and bright workplaces in the office and also in production areas ensure a good working atmosphere.

### **Extensive range of precision gauge strips and precision foils**

Our specialties are precision feeler gauge coils and sheets in hardened carbon steel 1.1274, stainless spring steel 1.4310 and brass.

For thicker shims, the alloys 1.2003 and 1.4034 (stainless hardened knife steel) are available in many thicknesses and with narrow thickness tolerances for tool making as well as mechanical and plant engineering.

### **Wide choice of materials for many different applications**

In addition, there is a large selection of materials available for many different applications such as:

- 1.1274 + 1.4031Mo + 1.4310 + 1.4404 hard + 1.4529hard + brass + bronze for springs
- 1.2003 + 1.4034 + 1.4037 + 1.2379 for gauges, machine knives and small tools
- 1.4767 + 1.4828 for heat-resistant parts
- 2.4668 (Alloy 718) for heat-resistant springs up to 600° Celsius
- 1.4404 + 1.4529 + nickel for corrosive environments
- Copper + Bronze + Aluminum for high conductivity parts
- Alloy I + Alloy K + Alloy Mu for parts in electrical engineering and electronics
- 1.0338 for simple washers

Almost all materials are available in a width of ca. 300mm, the materials 1.1274 and 1.4404 are also available in a width of approx. 600mm and the material 1.4310 is even available up to a width of 1250mm.

### **Fast and flexible delivery of small quantities**

All standard dimensions are available with a short delivery time. Larger quantities can also be delivered quickly from our extensive stock. Customized products can be made with our large machine park from mini to maxi, even in small quantities

### **Our machinery: flexible and efficient**

As a leading manufacturer of precision feeler gauge strips and shims, we are a valued partner and service provider for our customers - not least because we are able to react flexibly to our customers' wishes. In addition to well-trained and motivated employees, modern production facilities form the basis for our performance. The combination of these two parameters enables us to deliver both our standard dimensions in small and large quantities quickly and efficiently, as well as to cut strips and metal foils exactly according to customer requirements - individually in any width you require up to a width of 1250mm and also in customer-specific lengths.

Laser-cut parts from a thickness of 0.01mm can be cut from the material in stock, and laser marking is possible from a thickness of 0.10mm.

In addition, shims can be produced by flat grinding in desired thicknesses of 1.0-10.0mm in the hardened alloys 1.2003, 1.4034 and 1.2379.

### **Quality assurance and trackability**

Good labeling of most products with thickness, material and batch number makes it possible to trace our products back to the smelting plant. For our standard products up to 150mm wide, this information is also printed on the product label.

The number of the delivered batch is also printed on the delivery notes. Therefore, material certificates (as a copy based on DIN EN 10 204) with mechanical values and the chemical composition can also be issued later.

For quality reasons, the company h+s Präzisionsfolien GmbH only sells metal foils and strips only from European production. Long-term supplier declarations can be issued for all deliveries.

Special material from the USA and Japan is also offered through our sister company Schwab Metallfolien GmbH&Co. KG.





**We are more than “just” a precision foil supplier**

**With this claim, the company h+s Präzisionsfolien GmbH was founded more than 40 years ago and it is still valid for me as the owner and managing director.**

Every day, our employees do everything they can to fulfill your wishes with expertise and commitment. The highest priority is constant availability for our customers as well as only manufacturing and delivering the highest quality. Beside our standard products, we offer our customers all services related to our precision foils.

In addition to competent advice about the optimal material and quality for the customer's application, this also includes fast delivery from stock or the production of individual cuts as well as perfected product labeling. As a fair partner, we have been working with reliable sales partners in many countries for years, who also have our products in stock.

Through our and their activities and services, we are at home in all sectors in which mechanical precision with narrow tolerances is required, such as mechanical and plant engineering, automotive technology, aerospace, production companies and workshops.

With this expertise and services, we ensure maximum customer satisfaction for years to come.”



**Michael Schwab**  
owner and manager  
of h+s Präzisionsfolien  
GmbH





# OUR EXPERTISE IN THE PRODUCTION OF PRECISION GAUGE STRIPS, METAL FOILS AND INDIVIDUAL LASER CUTTING PARTS

## PRECISION SLITTING SERVICE

Our precision gauge tapes can be custom cut to the width you need, in all thicknesses from 0.03-1.0mm from the available materials. In the unalloyed steel DC04 and non-ferrous metals (except aluminium) the desired width is available up to 300 mm. The hardened carbon steel 1.1274 and the stainless spring steel 1.4404 can now be slit to any desired width up to 600mm, and the material 1.4310 to any desired width up to 1250mm (depending on the primary material) on our new slitting line.

Deburred or rounded edges are possible at an additional cost.

Depending on availability, the minimum length is around 50 meters; shorter lengths are also available for thicknesses over 0.80 mm. The strips can then also be provided with self-adhesive tape or cut to length. On request, the tapes can also be packed in plastic boxes or tin cans.

## SHEETS AND BLANKS

The strip material in thicknesses from 0.05 to 1.0 mm can be cut to any length with narrow length tolerances using electronic roller feeds and cut-to-length shears, in all available dimensions up to a width of 1250 mm. In the thickness range from 0.40 to 1.00 mm, the parts can also be flattened using precision leveling machines. Formats from 1.1 to 3.0 mm thick and up to 400 mm wide can be cut crosswise to shorter lengths using special scissors

## EDGE PROCESSING

Edge processing with hard metal tools can be used to produce a deburred or rounded edges in all hardened or temper rolled alloys, in thicknesses from 0.20 to 2.0 mm and widths from 6 to 150 mm.

For technical reasons, a minimum length of 100-120 meters is required.

## APPLYING OF SELF-ADHESIVE TAPE

Self-adhesive tapes of any width up to approx. 150 mm can be applied to our precision gauge tapes made of stainless steel or brass.

Different adhesive tape qualities are available to meet special applications. Depending on the recommended adhesive tape, the minimum length for this is approx. 50 or 100 meters. The strips can then be cut to your desired length.

## MATERIAL MARKING

Our strip material is permanently marked with all relevant data using an inkjet printer, so that the material can be traced back to the smelting plant. In addition, other important information about the material properties is printed on the labels on our standard products up to 150mm wide.





## INDIVIDUAL LASER CUTS

Here we work exactly according to your specifications such as CAD data, which we may optimize for production, or also according to sample parts. In addition to competent production advice, we can also provide samples of your laser part in terms of material and design.

## LASER CUTTING

Thanks to flexible production systems, even the smallest lot sizes can be cut quickly, reliably and cost-effectively:

- With the YAG laser machines, filigree parts can be manufactured in a thickness range of 0.01 to 2.0 mm with a tolerance of +/- 0.05 mm.
- From a thickness of 0.50 mm, parts can also be cut with CO2 lasers with a tolerance of +/- 0.10 mm.

Thanks to our extensive stock of different spring band steels, we can also produce sample parts in different materials or strengths for tests. Our large stock of coil material also enables the production of long parts up to approx. 3000 mm in length.

Nickel alloys such as Alloy I (material 1.3912), Alloy K (material 1.3981) and Alloy Mu (material 2.4545) are now also available in individual strengths for laser-cut parts.

## LASER MARKING

Laser cut parts can also be permanently marked with your part number or thickness.

Compared to embossing, engraving or etching processes, laser marking offers a high marking quality with the smallest batch sizes from 1 piece.

## FLAT GRINDING

Up to a size of 300x600 mm, drawing parts can be ground to individual thicknesses or closer tolerances of up to +/- 0.01 mm (larger formats on request).

To avoid high grinding costs, tool steel 1.2003 and stainless knife steel 1.4034 are available in many material thicknesses.

The material 1.4310 cannot be machined due to its low magnetizability.

As a supplement to our band-hardened material, shims can be manufactured from piece-hardened sheets from the materials 1.2379 and 1.4034 in the thickness range from 3.0 to around 10 mm. For technical reasons, these parts must be ground to the exact thickness.



# HARDENED CARBON STEELS

## STRIPS/COILWARE

Quant.:	PU = 1m	PU = 2m	PU = 5m	PU = 10m	PU = 5m	PU = 5m	PU = 5m	PU = 5m	PU = 5m	per m	per m	per m
Width in mm:	12,7	12,7	12,7	12,7	6	25	50	100	150	200-250	300-305	500-600
Thickness:	C-steel 1.1274 hardened	C-steel 1.1274 hardened	C-steel 1.1274 hardened	C-steel 1.1274 hardened	C-steel 1.1274 hardened	C-steel 1.1274 hardened	C-steel 1.1274 hardened	C-steel 1.1274 hardened	C-steel 1.1274 hardened	C-steel 1.1274 hardened	C-steel 1.1274 hardened	C-steel 1.1274 hardened
0,005	* (5)	* (5)	* (5)	* (5)								
0,01	* (5)	* (5)	* (5)	* (5)								
0,02	*	*	*	*								
0,03	*	*	*	*		*	*	*				
0,04	*	*	*	*		*	*	*				
0,05	*	*	*	*		*	*	*	*			
0,06	*	*	*	*	*	*	*	*				
0,07	*	*	*	*		*	*	*				
0,08	*	*	*	*		*	*	*				
0,09	*	*	*	*	*	*	*	*				
0,10	*	*	*	*		*	*	*	*	*	* (7)	
0,12	*	*	*	*	*	*	*	*		*		
0,15	*	*	*	*	*	*	*	*	*	*	* (7)	*
0,18	*	*	*	*	*	*	*	*		*		
0,20	*	*	*	*	*	*	*	*	*	*	* (7)	*
0,25	*	*	*	*	*	*	*	*	*	*		*
0,30	*	*	*	*	*	*	*	*	*		*	*
0,35	*	*	*	*			*				*	
0,40	*	*	*	*	*	*	*	*	*		*	*
0,45	*	*	*	*			*				*	*
0,50	*	*	*	*	*	*	*	*	*		*	*
0,55	*	*	*	*								
0,60	*	*	*	*		*	*	*			*	*
0,65	*	*	*	*								
0,70	*	*	*	*		*	*	*			*	*
0,75	*	*	*	*							* (*)	
0,80	*	*	*	*		*	*	*	*		*	*
0,85	*	*	*	*								
0,90	*	*	*	*		*	*	*			*	
0,95	*	*	*	*								
1,00	*	*	*	*		*	*	*	*		*	*
1,10	* (4)	* (4)	* (4)	* (4)								
1,20	* (4)	* (4)	* (4)	* (4)								
1,30	* (4)	* (4)	* (4)	* (4)								
1,40	* (4)	* (4)	* (4)	* (4)								
1,50												
1,60	* (4)	* (4)	* (4)	* (4)								
1,70	* (4)	* (4)	* (4)	* (4)								
1,80	* (4)	* (4)	* (4)	* (4)								
1,90	* (4)	* (4)	* (4)	* (4)								
2,00	* (4)	* (4)	* (4)	* (4)								

All products on this page with thickness tolerances according to T3.

- o = upon request
- (1) = different width 100-190 mm
- (2) = different width 200-299 mm
- (3) = also available in 305mm width on request
- (4) = Delivery only in pieces of 1000mm length while stocks last
- (5) = only available in material 1.4310
- (6) = also available in a length of 2000mm
- (7) = while stocks last
- (\*) = different specification
- (S) = Delivery via Schwab GmbH & Co. KG

# HARDENED CARBON STEELS

Net prices in Euro/packaging unit or meter (without VAT)

## FORMATS/SHIM STOCK FLAT PACKS AND SHEET

Quant:	PU = 10 pc.	PU = 10 pc.	PU = 5 pc.	PU = 5 pc.	PU = 1 pc.	PU = 1 pc.	PU = 1 pc.	PU = 1 pc.
Size in mm:	25x300	50x300	100x500	150x500	200-250x1000	300-305x1000	350x1000	610x1220
Thickness:	C-steel 1.1274 hardened	C-steel 1.1274 hardened	C-steel 1.1274 hardened	C-steel 1.1274 hardened	C-steel 1.1274 hardened	C-steel 1.1274 hardened	C-steel 1.2003 hardened	C-steel 1.2003 hardened
0,01	*(5)	*(5)						
0,02	*(5)	*(5)						
0,03	*	*						
0,04	*	*						
0,05	*	*						
0,06	*	*						
0,07	*	*						
0,08	*	*						
0,09	*	*						
0,10	*	*	*	*	*			
0,12		*			*			
0,15	*	*	*	*	*			
0,18		*			*			
0,20	*	*	*	*	*	*(7)		
0,25	*	*	*	*	*			
0,30	*	*	*	*		*		
0,35		*				*		
0,40	*	*	*	*		*		
0,45		*						
0,50	*	*	*	*		*		
0,60	*	*	*			*		*
0,70	*	*	*			*		*
0,75						*(*)		
0,80	*	*	*	*		*		*
0,90	*	*	*			*		*
1,00	*	*	*	*		*	*	*
1,20						*(*)		
1,50				*		*(*)	*	*
1,80						*(*)	*(7)	
2,00						*(*)	*	*
2,20							o	
2,40							o	
2,50							*	
2,60							o	
2,80							o	
3,00						*(*)	*	*
3,20							o	
3,50							*	
3,80							o	
4,00							*	o
4,50							o	
5,03							*	*(*)



Please note the information on thickness tolerances on page 10.



# NON-ALLOYED OR HARDENED SPECIAL STEELS

Net prices in Euro/package unit or meter (without VAT)

Quant.:	PU = 5m	PU = 5Pc.	per m	PU = 1Pc.	PU = 1Pc.	PU = 1Pc.	per m	PU = 1Pc.	PU = 1Pc.	per m
Size in mm:	150	150x500	305	ca. 300-310 x1000	ca. 600 x1000	ca. 380 x1000	ca. 300-380	360 x1000	360 x2000	170-300
Thickness:	unalloyed steel 1.0338 hard	unalloyed steel 1.0338 hard	unalloyed steel 1.0338 hard	C-steel 1.1248 soft	Cr-steel 1.2379 hardened	Cr-steel 1.4021 hardened	CrMo-steel 1.4031Mo hardened	Cr-steel 1.4034 hardened	Cr-steel 1.4034 hardened	Cr-steel 1.4037 hardened
0,025	*	*								
0,05	*	*								
0,075	*	*								
0,10	*	*	*							
0,15	*	*	*							
0,20	*	*	*	*						
0,25	*	*	*	*						
0,30	*	*	*	*						
0,40	*	*	*	*						
0,50	*	*	*	*						
0,60				*						
0,70				*						
0,80	*	*	*	*						
1,00	*	*	*	*						
1,10										
1,20										
1,30										
1,40										
1,50				*						
1,60										
1,70										
1,80										
1,90										
1,975										
2,00				*						
2,20										
2,50				*						
2,97										
3,00				*						
3,50										
4,00				*(*)						
4,50										
5,00				*(*)						
5,50										
6,50										
8,50										
10,50										

The products made of 1.4034 with thickness tolerances according to T3. All other materials with thickness tolerances according to DIN/EN (not T3).

o = on request

(1) = different width 100-190 mm

(2) = different width 200-299 mm

(3) = also available in 305 mm width on request

(4) = Delivery only in pieces of 1000 mm length while stocks last

(5) = only available in material 1.4310

(6) = also available in a length of 2000 mm

(\*) = different specification

(S) = Delivery via Schwab GmbH & Co. KG

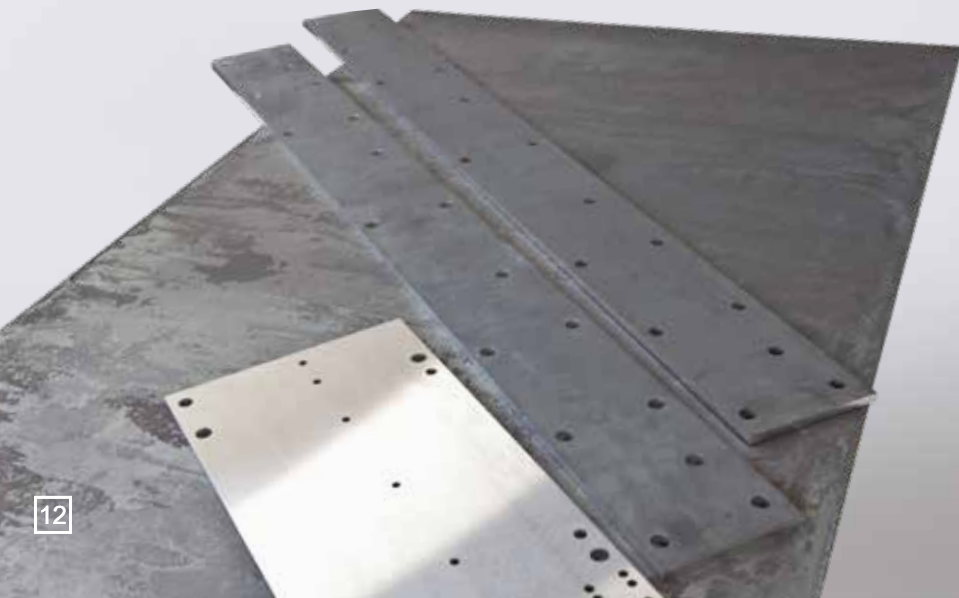
## PIECE-HARDENED TOOL STEELS

As a supplement to our products, we have hot-rolled plates in tool steel 1.4034 in thicknesses of 4.25 - 10.5 mm in stock, which have been hardened to 50-55 HRc using a special hardening process.

For very wear-resistant parts, we also have hot-rolled plates in tool steel 1.2379 in thicknesses of 2.20-5.50 mm with a hardness of 59-61 HRc in stock.

We can use these plates to produce laser-cut parts according to your drawings.

Due to poor thickness tolerance due to hot rolling and scaled surface due to hardening, surface grinding of cut parts is necessary.





# STAINLESS SPRING STRIP STEEL 1.4310

## STRIPS/COILWARE

Net prices in Euro/packaging unit or meter (without VAT)

Quant.:	per m	per m	per m	per m	per m	per m	per m	per m	per m	per m	
Width in mm:	ca. 300-305	ca. 300-305	ca. 300-305	ca. 300-305	ca. 600-630	ca. 600-630	ca. 600-630	ca. 600-630	1250	1250	1250
Thick-ness:	CrNi-steel 1.4310 F11-1300	CrNi-steel 1.4310 F13-1500	CrNi-steel 1.4310 F15-1700	CrNi-steel 1.4310 F>1900	CrNi-steel 1.4310 F11-1300	CrNi-steel 1.4310 F13-1500	CrNi-steel 1.4310 F15-1700	CrNi-steel 1.4310 F15-1700	CrNi-steel 1.4310 F11-1300	CrNi-steel 1.4310 F13-1500	CrNi-steel 1.4310 F15-1700
0,01			*(2)								
0,0127		*(S)									
0,02		*(S)	*(2)								
0,025			*(2)								
0,03		*									
0,04		*									
0,05		*	*			*					
0,055			*								
0,06			*								
0,065			*								
0,07			*								
0,075			*								
0,08			*								
0,085			*								
0,09			*								
0,095			*								
0,10	*	*	*	*			*				o (*)
0,11			*								
0,12			*				*				
0,13			*								
0,14			*								
0,15	*	*	*	*		*	*			o	o
0,16			*								
0,17			*								
0,18			*			*(7)	*				
0,19			*				*				
0,20	*	*	*	*	*	*	*		o	o	o
0,21			*								
0,22			*								
0,23			*								
0,24			*								
0,25	*	*	*	*	*	*	*		o	o	o
0,26			*								
0,27			*				*				
0,28			*								
0,29			*				*				
0,30	*	*	*	*	*	*	*		o	o	o
0,35			*				*				
0,38			*								
0,40	*	*	*	*	*	*	*		o	o	o
0,45			*				*				
0,50	*	*	*	*	*	*	*		o	o	o
0,55			*				*				
0,60	*	*	*	*(*)		*	*			o	o
0,65			*				*				
0,70	*		*				*				
0,75			*								
0,80	*	*	*	*	*	*	*			o	o
0,85			*								
0,90			*				*				
0,95			*								
1,00	*	*	*	*	*	*	*			o	

All products in 1.4310 up to 150mm width and only the products in 300-310mm width with a tensile strength of 1500-1700 N/mm<sup>2</sup> with thickness tolerances according to T3. All other dimensions in 300-310 mm width with other tensile strengths as well as 600-630 mm and from 1000 mm width with thickness tolerances according to EN 9445.

- o = on request
- (1) = different width 100-190 mm
- (2) = different width 200-299 mm
- (3) = also available in 305 mm width on request
- (4) = Delivery only in pieces of 1000 mm length while stocks last
- (5) = only available in material 1.4310
- (6) = also available in a length of 2000 mm
- (7) = while stocks last
- (\*) = different specification
- (S) = Delivery via Schwab GmbH & Co. KG



# ACID AND HEAT RESISTANT SPECIAL STEELS

Net prices in Euro/package unit or meter (without VAT)

Quant.:	per m	per m	per m	per m	per m	per m	per m	per m
Width in mm:	300-310	ca. 610	ca. 300-310	ca. 610	ca. 400	ca.400	ca. 300-320	ca. 300-335
Thickness:	CrNiMo-steel 1.4404 soft	CrNiMo-steel 1.4404 soft	CrNiMo-steel 1.4404 hard	CrNiMo-steel 1.4404 hard	CrNiMo-steel 1.4529 soft	CrNiMo-steel 1.4529 hard	Heat resistant 1.4767 hard	Heat resistant 1.4828 soft
0,003			o (*)					
0,01			* (1)					
0,02			* (1)					
0,03			* (1)				*	
0,04			* (1)					
0,05	*(s)		* (2)			*	*	
0,075						*		
0,08	*		*					
0,10	*		*	*		*	*	
0,15	*	*	*	*	*	*	*	*
0,20	*	*	*	*	*	*	*	*
0,25	*	*	*	*				*
0,30	*	*	*	*	*	*		*
0,40	*	*	*	*	*	*		
0,50		*	*		*	*		
0,60		*						
0,80		*						
1,00		*						
1,50			*(6)					
2,00			*(6)					

- o = on request
- (1) = different width 100-190 mm
- (2) = different width 200-299 mm
- (3) = also available in 305 mm width on request
- (4) = Delivery only in pieces of 1000 mm length while stocks last
- (5) = only available in material 1.4310
- (6) = also available in a length of 2000 mm
- (7) = while stocks last
- (\*) = different specification
- (S) = Delivery via Schwab GmbH & Co. KG





# NON-FERROUS METALS

Net prices in Euro/package unit or meter (without VAT)

Quant.:	PU = 5m	PU = 5pc.	per m	PU = 5m	PU = 5pc.	per m	PU = 5m	PU = 5pc.	per m	PU = 5m	PU = 5pc.
Width in mm:	150	150 x 500	300 - 305	150	150 x 500	300 - 305	150	150 x 500	300 - 305	150	150 x 500
Thickness:	Copper SE-Cu58 2.0070 hard	Copper SE-Cu58 2.0070 hard	Copper SE-Cu58 2.0070 hard	Brass CuZn37 2.0321 hard	Brass CuZn37 2.0321 hard	Brass CuZn37 2.0321 hard	Bronze CuSn6 2.1020 hard	Bronze CuSn6 2.1020 hard	Bronze CuSn6 2.1020 hard	Aluminium hard	Aluminium hard
0,005	*(1)										
0,006				*							
0,01	*	*	*	*	*						
0,02	*	*	*	*	*						
0,025				*	*		*	*	*	*	*
0,03				*	*						
0,035	*	*									
0,04	*(7)	*(7)		*	*						
0,05	*	*	*	*	*	*	*	*	*	*	*
0,06			*								
0,07										*	*
0,075				*	*	*					
0,10	*	*	*	*	*	*	*	*	*	*	*
0,15	*	*	*	*	*	*	*	*	*	*	*
0,20	*	*	*	*	*	*	*	*	*	*	*
0,25	*	*	*	*	*	*	*	*	*	*	*
0,30	*	*	*	*	*	*	*	*	*	*	*
0,40	*	*	*	*	*	*					
0,50	*	*	*	*	*	*					
0,60				*	*						
0,70				*	*						
0,80				*	*						
0,90				*	*						
1,00				*	*	*					

The products made of brass have thickness tolerances according to T3.  
All other alloys have thickness tolerances according to DIN/EN-norms (not T3).

## ASSORTMENTS

Item	Size in mm	Sheet	Contents: 1 sheet	Euro
Assortment 25 - 1.1274	25 x 300	21	0,01 (1.4310)/0,02 (1.4310)/0,03/0,04/0,05/0,06/0,07/0,08/0,09/0,10/0,15/0,20/0,25/0,30/0,40/0,50/0,60/0,70/0,80/0,90/1,00 mm	*
Assortment 50/1 - 1.1274	50 x 300	25	0,01 (1.4310)/0,02 (1.4310)/0,03/0,04/0,05/0,06/0,07/0,08/0,09/0,10/0,12/0,15/0,18/0,20/0,25/0,30/0,35/0,40/0,45/0,50/0,60/0,70/0,80/0,90/1,00 mm	*
Assortment 50/2 - 1.1274	50 x 300	23	wie 50/1 ohne 0,01/0,02 mm	*
Assortment 50/3 - 1.1274	50 x 300	11	0,02 (1.4310)/0,03/0,05/0,10/0,15/0,20/0,25/0,30/0,40/ 0,50/1,00 mm	*
Assortment 100/1 - 1.4310	100 x 500	9	0,02/0,05/0,10/0,15/0,20/0,30/0,40/0,50/ 1,00 mm	*
Assortment 100/2 - 1.4310	100 x 500	11	0,02/0,05/0,10/0,15/0,20/0,25/0,30/0,35/0,40/ 0,45/0,50 mm	*
Assortment 100/3 - 1.4310	100 x 500	11	0,50/0,55/0,60/0,65/0,70/0,75/0,80/0,85/0,90/ 0,95/1,00 mm	*
Assortment 150 - 1.4310	150 x 500	10	0,025/0,05/0,075/0,10/0,15/0,20/0,25/0,30/0,40/0,50 mm	*
Assortment 150 Brass	150 x 500	10	0,025/0,05/0,075/0,10/0,15/0,20/0,25/0,30/0,40/0,50 mm	*

All assortments have thickness tolerances according to T3.

# NICKEL AND NICKEL ALLOYS

Net prices in Euro/packaging unit or meter (without VAT)

Quant.:	per m	per m	PU = 5m	PU = 5St.	per m	per m	per m
Width in mm:	ca. 300-340	ca. 300-340	150	150x500	300-320	300-340	300-310
Thickness:	Alloy I 1.3912 annealed	Alloy K 1.3981 annealed	Nickel Ni99,2% 2.4068 hard/half hard	Nickel Ni99,2% 2.4068 hard/half hard	Nickel Ni99,2% 2.4068 hard/half hard	Alloy Mu 2.4545 annealed	Alloy 718 2.4668 annealed
0,01			*(1)	*(1)			
0,02			*(1)	*(1)			
0,05			*	*			
0,10	*	*	*	*	*	*	*(s)
0,15			*	*	*		*(s)
0,20	*	*	*	*	*	*	*(s)
0,25		*	*	*	*		*(s)
0,30		*	*	*	*		*(s)
0,35	*(2)						
0,38		*					*(s)
0,50		*					*(s)
0,65						*	

o = on request

(1) = different width 100-190 mm

(2) = different width 200-299 mm

(3) = also available in 305 mm width on request

(4) = Delivery only in pieces of 1000 mm length while stocks last

(5) = only available in material 1.4310

(6) = also available in a length of 2000 mm

(7) = while stocks last

(\*) = different specification

(S) = Delivery via Schwab GmbH & Co. KG







Cr-steel	Cr-steel	CrNi-steel	CrNiMo-steel	CrNiMo-steel	Heat resist:steel	Heat resist:steel	Copper	Brass	Bronze
1.4034 (1.2083)	1.4037	1.4310	1.4404	1.4529	1.4767	1.4828	2.0070	2.0321	2.1020
X46Cr13 420 S 42000	X65Cr13 420 high Carbon S42000	X12CrNi17-7 301 S 30100	X2CrNiMo17-12-2 316L S 31603	X1 NiCrMoCuN25-20-7 926 N08926	X8CrAl20-5	X15CrNiSi20-12 309 S 30900	SE-Cu58/CW021A  C 10300	CuZn 37  C 27200	CuSn6/CW452K  C 51900
360 mm 1,00 - 10,5 mm EN 10258 R T 3	165 - 290 mm 0,25 - 0,40 mm EN 9445	10 - 1000 mm 0,003 - 3,00 mm EN 10258 R T 3 (teilw. EN 10258)	ca. 300 mm 0,01 - 1,00 EN 10258 R EN 10258 (teilw. T3)	ca. 400 mm 0,15 - 0,50 EN 10258 R EN 10258	ca. 300 mm 0,03 - 0,20 mm EN 10 258	ca. 300 mm 0,15 - 0,30 mm EN 10 258	150 + 305 mm 0,005 - 0,50 mm  +/- 10%	150 + 305 mm 0,01 - 1,00 mm DIN 1791 T 3	150 + 305 mm 0,05 - 0,30 mm
Ground	Polished	2H	2R/2H	2R/2H	Bright	Bright	Bright	Bright	Bright
Cut	Cut	Cut	Cut	Cut	Cut	Cut	Cut	Cut	Cut
Normal	Normal	SR	Normal	Normal				DIN 13599	
Extra precise	Normal	Wave height max. 1 mm	DIN	DIN				DIN 13599	
Hardened and tempered (H+A)	Hardened and tempered (H+A)	Cold rolled – spring tempered	Cold rolled, an- nealed or spring tempered	Cold rolled, annealed or spring tempered	Temper rolled	Annealed	Temper rolled	Spring tempered	Spring tempered
HRC 50-54	1900-2100 N/ mm <sup>2</sup>	See tensile strengths table	540-750 N/ mm <sup>2</sup> (annealed) >1100 N/mm <sup>2</sup>	650-900 N/mm <sup>2</sup> 1250-1500 N/mm <sup>2</sup> (hard)	ca. 1000 N/mm <sup>2</sup>	540 – 750 N/mm <sup>2</sup>	>300 N/mm <sup>2</sup>	See tensile strengths table	HV 160-190
0,43-0,50%	0,58-0,70%	0,05-0,15%	max. 0,03%	max. 0,02%	max. 0,10%	max. 0,20%			
max. 1%	max. 1%	max. 2,0%	max. 1,0%	max. 0,5%	max. 1,0%	1,5-2,5%		-	
max. 1,0%	max. 1,0%	max. 2,0%	max. 2,0%	max. 1,0%	max. 1,0%	max. 2,0%			
max. 0,04%	max. 0,040%	max. 0,045%	max. 0,045%	max. 0,03%	max. 0,045%	max. 0,045%	0,002-0,007%		0,01-0,4%
max. 0,015%	max. 0,015%	max. 0,015%	max. 0,015%	max. 0,01%	max. 0,03%	max. 0,015%			
12,5-14,5%	12,5-14,5%	16-19%	16,50-18,50%	19-21%	19,0 – 22,0 %	19,0-21,0%			
-	-	6,0-9,5%	10,0-13,0%	24-26%	max. 0,30%	11,0-13,0%			max. 0,2%
-	-	max. 0,80%	2,0-2,5%	6-7%					
-	-				4,00-6,50%				
-	-			0,5-1,5%			>99,95%	62-64%	balance
-	-						max. 0,005%	max. 0,1%	max. 0,02%
-	-								5,5-7,0%
-	-							balance	max. 0,2%
balance	balance	balance	balance	balance	balance	balance			max. 0,1%
				0,15-0,25%	max. 0,01%	max. 0,11%			
-	-				Traces of Zr+Y+Hf		max. 0,03%		max. 0,2%

#### Stainless precision strip steel, mat. no. 1.4404

Due to a higher nickel and molybdenum content, this material is significantly more corrosion-resistant than 1.4301 or 1.4310. In the annealed condition, this material is very easy to deep-draw due to the high nickel content. In the hard rolled condition, this material can be used for springs in corrosive environments. Similar to 1.4310, hard rolling makes 1.4404 slightly magnetizable, but due to the higher nickel content, the magnetism is lower than that of 1.4310.

#### Stainless precision strip steel, mat. no. 1.4529 (Alloy 926)

This material was developed from the material 1.4539 (Alloy 904) to achieve even better corrosion resistance and workability. With a nickel content of 24% and a molybdenum content of 6%, it has excellent corrosion resistance and is also resistant to seawater at higher temperatures and higher salinity. It is also approved for pressure vessels in temperature ranges from -196 to +400° Celsius. This material has been approved by the German Institute for Structural Engineering for components and fasteners in swimming pools. In temper-rolled condition, this material is almost non-magnetic.

#### Heat-resistant ferritic chrome steel, mat. no. 1.4767

With the addition of around 6% aluminum and traces of yttrium and hafnium, this ferritic steel is very heat-resistant up to 1200° Celsius. This material is stocked in the hard rolled condition, but will soften on initial heating. This alloy is used for heating conductors in hobs, sensors and in exhaust gas cleaning. Ferritic steels are magnetizable.

#### Heat-resistant austenitic steel, mat. no. 1.4828

Due to a high proportion of chromium, nickel and silicon, this material is heat-resistant up to 1000° Celsius. This material is stocked in the annealed condition.

#### Hard-rolled Copper strip, mat. no. 2.0070 (SE-Cu58)

Alloy SE-Kupfer58 is superior to commonly used copper grades E-Cu (UNS C11000) and SF-Cu (UNS C12200) with a minimum copper content of 99.95% and low oxygen and phosphorus content. This material is used in general electrical engineering for cable ties and connectors, transformer coils, semiconductor carriers and stamped and bent parts (e.g. for seals).

#### Hard-rolled Brass strip, mat. no. 2.0321

With a composition of 63% copper and 37% zinc, this material is the standard grade for spring-hard rolled brass. This material is not magnetic. With brass, please note the rolling direction when using it as a flat spring or when folding and bending.

#### Hard-rolled Bronze strip, mat. no. 2.1020 (CuSn6)

The bronze alloy CuSn6 with about 6% tin content is the most commonly used type of bronze. Typical application examples are connectors, contact pins and general stamped and bent parts as well as springs where good electrical conductivity is important. In contrast to brass, bronze can also be used in vacuum technology.

# MATERIAL INFORMATION

Material		Alloy I	Alloy K	Nickel	Alloy Mu	Alloy 718	Al-Alloy	Aluminium
Material number		1.3912	1.3981	2.4068	2.4545	2.4668		3.0205
Designation	DIN/EN UNS	FeNi36 K93600/K93603	FeNi29Co18Mn K94610	LC-Ni 99,2% N 02201	NiFe15Mo N14080	NiCr19Fe19N- b5Mo3 N07718	EN-AW 8079 A98079	EN-AW 1200 A91200
Dimensions	Widths Thicknesses Width tolerance Thickness tol.	200-340 0,10-0,35 mm DIN 59746 DIN 59746	305-340 0,10-0,50 mm DIN 59746 DIN 59746	100-320 mm 0,01 – 0,30 mm DIN 59746 DIN 59746	305-340 mm 0,10-0,64 mm DIN 59746 DIN 59746	300-310 mm 0,10-0,50 mm DIN 59746 DIN 59746	150 mm 0,025 mm	150 mm 0,05 – 0,20 mm
Surface		Bright	Bright	Bright	Bright	Bright	Bright	Bright
Edge form		Cut	Cut	Cut	Cut	Cut	Cut	Cut
Straightness		DIN 59746	DIN 59746	DIN 59746	DIN 59746	DIN 59746		
Flatness		DIN 59746	DIN 59746	DIN 59746	DIN 59746	DIN 59746		
Rolled condition		Cold rolled	Cold rolled	Hard or half hard	Annealed	Annealed	Temper rolled	Temper rolled
Tensile strength/ Hardness		HV 120-190	max. 170 HV	ca. 500-1000 N/ mm <sup>2</sup>	max. 170 HV	ca. 850 N/mm <sup>2</sup>	>180 N/mm <sup>2</sup>	> 150 N/mm <sup>2</sup>
Material- composition	C:	<0,05%	<0,05%	max. 0,02%	max. 0,05%	max. 0,08%		
	Si:	max. 0,30%	<0,30%	max. 0,25%	max. 0,5%	max. 0,35%	0,05-0,3%	Si+Fe max. 1%
	Mn:	max. 0,50%	<0,50%	max. 0,35%	max. 1%	max. 0,35%		max. 0,05%
	P:	<0,015%			max. 0,02%	max. 0,015%		
	S:	<0,015%		max. 0,005%	max 0,01%	max. 0,015%		
	Cr:	<0,25%			max. 0,3%	17-21%		
	Ni:	35-37%	28-30%	> 99,0%	80-82%	50-55%		
	Mo:				2-6%	2,8-3,3%		
	Al:					0,30-0,70%	balance	>99,0%
	Cu:			max. 0,25%	max. 0,3%	max. 0,30%	max. 0,05%	max. 0,05%
	Pb:					max. 5ppm		
	Sn:							
	Zn:						max.0,1%	max. 0,1%
	Fe:	balance	balance	max. 0,4%	balance	balance	0,7-1,3%	Si+Fe max. 1%
N:								
		Co: 16-18%		Ti: max. 0,1%		V: 0,7 - 0,9% Nb: 4,7-5,5%	max. 0,15%	max. 0,15%

## Alloy I, material no. 1.3912

Iron-nickel alloy with a very low coefficient of thermal expansion for components and molds that require high length stability with temperature fluctuations. This material is also used for components in the electronics industry due to its very high permeability.

## Alloy K, material no. 1.3981

Iron-nickel-cobalt alloy with thermal expansion similar to borosilicate glasses and alumina ceramics. It is used for metal-glass passageways of electronic components, material transitions in vacuum chambers, etc., as well as for submounts in microsystems technology.

## Pure Nickel, mat. no. 2.4068 (Ni 99.2)

Pure nickel has very good corrosion resistance, especially in alkaline media, even at temperatures above 300°C. It is used in chemical apparatus construction and in the pharmaceutical industry. Since nickel is insensitive to chemical attack, it ensures the absolute purity of the processed products. Nickel is available in thicknesses from 0.01 to 0.05 in hard-rolled condition, in thicknesses from 0.10 to 0.30mm in semi-hard condition.

## Alloy Mu, material no. 2.4545

Nickel-iron alloy with about 4.5% molybdenum, with the highest technically achievable permeability values and very small coercive field strength. This alloy is used for instrument transformers, circuit breakers and magnetic shields.

## Alloy 718, mat. no. 2.4668

The alloy 718 is precipitation hardenable and has very good spring properties even at very low temperatures up to a maximum of 650° Celsius as well as very good corrosion resistance. Our raw material is annealed and after processing it has to be heat-treated in order to achieve a high tensile

strength of over 1240 N/mm<sup>2</sup>. When hardened, this material retains high tensile strength up to around 650° Celsius and is stronger than comparable materials. Used in gas turbines, turbochargers, and springs and fasteners that are exposed to a wide range of temperatures or severe corrosion. This alloy is not magnetizable. The sale is carried out by our sister company Schwab Metallfolien GmbH&Co. KG. Since all the primary material comes from the USA, no supplier declarations can be issued for it.

## Aluminum alloy EN-AW 8079

Due to its low specific weight and good formability, aluminum can be used for a wide range of applications. With the alloy EN-AW 8079, a higher tensile strength is achieved through the addition of iron and silicon. This alloy is therefore used for aluminum foils up to about 0.05 mm thick.

## Pure aluminum, mat. no. 3.0205 (Al 99.0%)

Because of its relatively good thermal conductivity, pure aluminum is also used for heat exchangers (although alloys 3003 or 6063 should be used for brazed heat exchangers). Due to its high electrical conductivity, aluminum can also be used in the electronics industry and, due to its high level of reflection, also for lamp reflectors.

## APPLICATION EXAMPLES

Due to the high tensile strength of our spring steel strips, laser cutting is an ideal process for manufacturing precise parts. Even the smallest batch quantities can be manufactured quickly, reliably and cost-effectively, e.g.:



- Feeler gauges and setting gauges in many strengths according to customer drawings



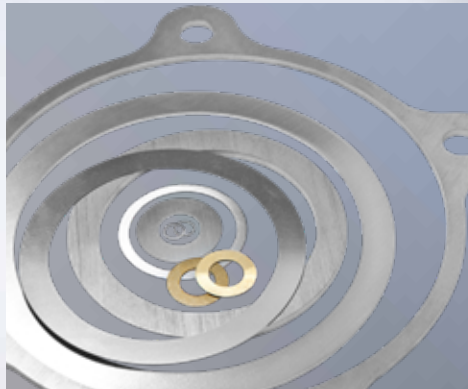
- Compensation foils for adjusting tool heads in the micrometer range from 0.01 to 0.075 mm



- Compensating parts from 0.10 to 0.30 mm for assembling machine tools



- Laser cut parts can be produced from maxi to micro in the hundredth range



- Shims according to DIN 988 in many intermediate thicknesses and individual diameters



- Spring steel discs up to a diameter of 600 mm
- Leaf springs, brackets, machine parts of higher strength or abrasion resistance
- Sets of compensating parts for tool making from 0.10 to 2.0 mm thickness

h+s precision films with a thickness of 0.01 mm or more are available as primary material. In the alloy 1.4310, parts with a thickness of between 0.05 mm and 1.0 mm are also possible with a width of up to 600 mm, and between 0.10 and 1.00mm even up to a width of approx. 1250 mm.

As an inexpensive alternative to stainless spring steels, parts can be cut from hardened carbon steel 1.1274 (C100S) from a thickness of 0.03 mm and in thicknesses from 0.60 to 5.0 mm in hardened tool steel 1.2003 (75Cr1).

If there are high demands on flatness and hardness, the stainless, hardened steels 1.4031Mo and 1.4034 are available in thicknesses from 0.075 to 3.00 mm. Between 3.0 and approx. 10 mm thickness, laser parts can be cut from piece-hardened plates in the materials 1.2379 and 1.4034 and then ground to thickness.



## SHIPPING AND PAYMENT

The prices stated in this catalog apply exclusively to direct deliveries from h+s Präzisionsfolien GmbH to customers in Germany and all EU countries except Italy and Spain.

Please ask the h+s importer in your country about the prices and terms of delivery that apply to other countries.

### Terms of delivery Germany

- Value of goods (excl. VAT) less than 50 euros ex works, excluding packaging.
- Value of goods (excl. VAT) from 50 euros free of charge including packaging.
- Dimensions over 150 mm wide, custom-made products and laser-cut parts are always ex works, excluding packaging.
- Please see our website for current shipping costs.
- Dimensions from 1000 mm width can only be shipped by forwarding agency.

### Discount

- 5% discount for orders over EUR 125 (excl. VAT).
- 10% discount for goods valued at or above EUR 250 (excl. VAT).
- 15% discount for orders over EUR 500 (excl. VAT):

### Terms of payment

- From the invoice date within 10 days with a 2% discount or 30 days net.
- However, amounts under 30 euros are immediately net.
- For international transfers plus bank charges.
- For transfers within the euro zone with IBAN and BIC without bank fees.

## h+s Präzisionsfolien GmbH

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### Delivery time

- A few days after receipt of order, non-binding.
- Urgent small orders for standard products up to 150 mm wide and formats in 305x1000 and 610x1000 mm will be dispatched on the same day if possible if received by 11:00 a.m.
- Special widths and laser-cut parts: Delivery time on request