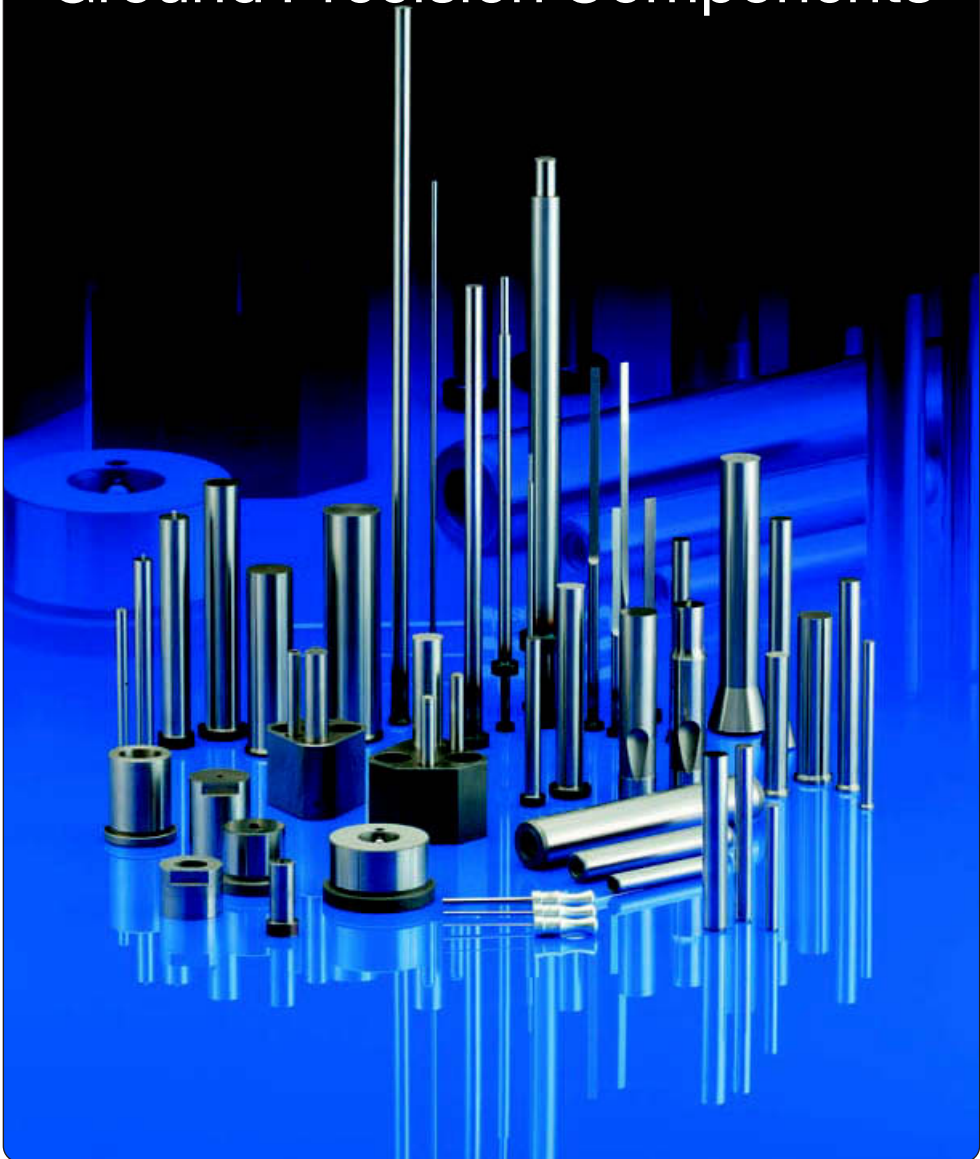




# Ground Precision Components



A Die Sets

---

B Precision Ground Plates and Flat Bars

---

C Lifting and Clamping Devices

---

D Lifting and Clamping Devices

---

 **E Ground Precision Components**

Punches and Matrixes,  
Pins, Ejector Pins, Gauge Pins

---

F Springs

---

G Elastomer-Bars,- Sheets,- Sections

---

H FIBRO Chemical Tooling Aids

---

J Peripheral Equipment

---

K Slide Units

---

L Literature

---

M Price List

---



## Ground Precision Components

FIBRO Precision Components cover a very wide range of materials, shapes and sizes and thus permit virtually unrestricted selection even to highly individual requirements.

At Hassmersheim and also abroad, stock levels of Precision Components reach seven-digit figures. It is therefore quite likely that your particular choice will be available for immediate delivery. Should this not be the case then our flexible batch production schedules will ensure that delays are kept to a minimum.

Batch production in our interpretation not only spells prompt delivery but also exceptional quality. Starting with the arrival inspection of raw materials, every single manufacturing operation on FIBRO Precision Components is followed by a quality check. Lastly, an uncompromising final inspection of each and every part guarantees that the trade mark FIBRO is and remains synonymous with Quality.

In view of the fact that a large portion of the Precision Components-programme consists of punches and matrices, the importance of alignment in the operational die must be emphasized. Unless this requirement can be met to a high degree of accuracy, even the finest efforts in design and in the toolroom must fail! Die alignment ultimately depends on the guides – FIBRO Die Sets and Guide Elements were developed and are made with this postulate in mind.











Tool life, production cost and work quality are to a large extent a function of tooling material selection versus strip stock characteristics and ancillary process conditions. A judicious choice from the wide range of materials for our punches and matrices will be facilitated by the orientation guide in this catalogue. Listing the principal characteristics of each material together with selection criteria, it is intended to help customers make the right choice.

Our experienced tooling specialists will assist you with further detailed information.

In keeping with the basic tenet of our firm, every effort is made to ensure that design, performance potential and quality of FIBRO Precision Components keep well abreast with latest technological developments.



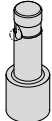

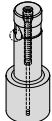









# Contents



Description of Materials	Page		Page
Assembly Guide Lines for Head Type Punches with Round Points	€ 10-€ 11, € 24		221. Precision Punches DIN 9844, Shape B € 19
222. Precision Punches DIN 9861, Shape DA	€ 12		266. Precision Punches Similar to VDI 3374 € 21
223. Precision Punches DIN 9861, Shape D/ISO 6752	€ 13		267. Precision Punches with Shedder Pin € 22
224. Precision Punches DIN 9861 Shape CA and C	€ 14		268. Precision Punches with Shedder Pin Stepped, Short Point € 23
225.			
274. Precision Punches Similar to DIN 9861 Shape CA+C	€ 15		269. Precision Punches with Shedder Pin Stepped, Long Point € 23
275.			
232. Stepped Quill Punches – Conical Head VDI 3374	€ 16		270. Carbide Punches – similar to DIN 9844 + DIN 9861 Cylindrical Head – Straight € 25
233. Head Type Quill Bush and Thrust Pin VDI 3374	€ 16		271. Carbide Punches – similar to DIN 9844 + DIN 9861 Cylindrical Head – Stepped € 25
234. Ball Lock Type Quill Bush and Thrust Pin VDI 3374	€ 16		272. Carbide Punches – similar to DIN 9844 + DIN 9861 Conical Head – Straight € 25
2281. Round Precision Punches with tapered heads 30°, Shape D	€ 17		273. Carbide Punches – similar to DIN 9844 + DIN 9861 Conical Head – Stepped € 25
2291. Round Precision Punches with tapered heads 30°, Shape C	€ 17		2202. Ball-lock punches, blank, light duty € 30-€ 31
220. Precision Punches DIN 9844, Shape A	€ 19		2212. Ball-lock punches, stepped, light duty
			2222.
			2232.
			2242.
			2252.

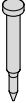













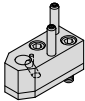


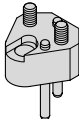


# Contents

		Page			Page		
	2702.	Ball-lock punches, blank with ejector pin, light duty	E 32–E 33		2205. 2215. 2225. 2235. 2245. 2255.	Ball-lock punches, punch larger than shaft, heavy duty	E 44–E 45
	2712. 2722. 2732. 2742. 2752.	Ball-lock punches, stepped with ejector pin, light duty					
	2204. 2214. 2224. 2234. 2244. 2254.	Ball-lock punches, punch larger than shaft, light duty	E 34–E 35		2705. 2715. 2725. 2735. 2745. 2755.	Ball-lock punches, punch larger than shaft, heavy duty with ejector pin	E 46–E 47
	2704. 2714. 2724. 2734. 2744. 2754.	Ball-lock punches, punch larger than shaft, light duty with ejector pin	E 36–E 37		2263.	Ball-lock pilot pins, with tapered tip, heavy duty	E 48
	2262.	Ball-lock pilot pins, with tapered tip, light duty	E 38		2273.	Ball-lock pilot pins, with parabolic tip, heavy duty	E 49
	2272.	Ball-lock pilot pins, with parabolic tip, light duty	E 39		2201. 2211. 2221. 2231. 2241. 2251.	Precision Punches, ISO 8020	E 54–E 55
	2203. 2213. 2223. 2233. 2243. 2253.	Ball-lock punches, blank, heavy duty	E 40–E 41			Precision Punches, stepped, ISO 8020	
	2703. 2713. 2723. 2733. 2743. 2753.	Ball-lock punches, blank with ejector pin, heavy duty	E 42–E 43		2701.	Precision Punches with Shedder Pin, ISO 8020	E 56–E 57
	2713. 2723. 2733. 2743. 2753.	Ball-lock punches, stepped with ejector pin, heavy duty			2711. 2721. 2731. 2741. 2751.	Precision Punches stepped, with Ejector Pin ISO 8020	



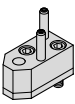





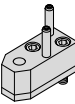




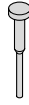





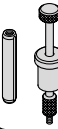

# Contents



		Page			Page
	2261. Pilot pins with tapered tip, ISO 8020	E 58		2612. Precision Matrixes with Collar, cylindrical	E 76
	2271. Pilot pins with parabolic tip, ISO 8020	E 59		2601. Precision Matrixes without Collar, conical	E 77
	2276. Pilot units to DC-Standard	E 60		2611. Precision Matrixes with Collar, conical	E 77
	2606. Precision matrixes without shoulder, cylindrical, ISO 8977	E 65 – E 67		Standardised Special Shapes Punches/Cutting bushes	E 79–E 83
	2616.				
	2626.				
	2636.				
	2646.				
	2656.			2618. Dynamic Strippers	E 84
	2607. Precision matrixes with shoulder, cylindrical, ISO 8977	E 69 – E 71			
	2617.				
	2627.			2664.05. Triangle retainers for Ball-Lock Punches, light duty	E 86–E 88
	2637.			2664.06. heavy duty	
	2647.			2664.10.	
	2657.			2664.08.	
				2664.09.	
	2605. Matrixes without shoulder, automotive standard	E 72–E 73		Accessories for retainers, triangular, for Ball-Lock Punches	E 89
	2615.				
	2625.				
	2635.				
	2645.				
	2655.				
	262. Precision Guide Bushes for Punches DIN 9845, Shape C	E 74		2661.07. Square Ball-Lock Retainers for Quick-Change Punches, light duty	E 90
	2621. Precision Guide Bushes for Punches ISO 8978	E 74			
	260. Precision Matrixes without Collar DIN 9845 Shape A	E 75		2662.05. Rectangular Ball-Lock Retainers for Quick-Change Punches to VDI 3374	E 91
	261. Precision Matrixes with Collar DIN 9845 Shape B	E 75			
	2602. Precision Matrixes without Collar, cylindrical	E 76		2664.02. Triangle Retainers for round Punches, ISO 8020	E 94
				2664.04. for Punches, ISO 8020	
				Accessories for retainers, triangular, for Quick-Change Punches, ISO 8020s	E 95



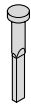
# Contents


	Page		Page
 <p>2661.01. Square Retainers 2661.02. for Punches to ISO 8020</p>	E 96	 <p>265.1. High-Precision Liner Bushes 2650.1. for Dowel Pins, for bonding for push fit</p>	E 110
 <p>2662.01. Rectangular Retainers 2662.02. for Punches to ISO 8020</p>	E 97	 <p>235.1. Precision Dowel Pins (Parallel) similar to DIN EN ISO 8734/ISO 8734</p>	E 111
 <p>2661.03. Square Retainers 2661.04. for round Punches to VDI 3374</p>	E 100	 <p>276. Precision Drill Bushes Shape A DIN 172, with collar</p>	E 113
 <p>2661.05. Square Retainers 2661.06. for Profile Punches to VDI 3374</p>	E 101	 <p>277. Precision Drill Bushes Shape A DIN 172, without collar</p>	E 113
 <p>2662.03. Rectangular Retainers 2662.04. for Punches to VDI 3374</p>	E 102	 <p>237.1. Hardened Ejector Pins similar to DIN 1530 Shape A-ISO 6751</p>	E 114
 <p>2431.7. Stripping unit</p>	E 104	 <p>237.8. Hotwork Precision Ejector Pins Nitrided ISO 6751</p>	E 115
 <p>2667. Stripping unit mountings</p>	E 105	 <p>238.1. Hardened Ejector Pins similar to DIN 1530 Shape C-ISO 8694</p>	E 116
<p>High-Precision Special Parts</p>	E 106–E 107	 <p>238.8. Hotwork Precision Ejector Pins Nitrided DIN 1530 Shape C-ISO 8694</p>	E 117
 <p>230. Precision Punches, Square/Rectangular without Head</p>	E 108	 <p>239.1. Hardened Ejector Pins Conical Head DIN 1530 Shape D</p>	E 118
 <p>231. Precision Punches, Square/Rectangular with Hot Upset-Forged Head</p>	E 108	 <p>239.8. Hotwork Precision Ejector Pins Nitrided – similar to DIN 1530 Shape D</p>	E 119
 <p>236.1. Precision Dowel Pins (Parallel) with Internal Extracting Thread similar to DIN EN ISO 8735/ISO 8735 Dowel Pin Extractor FIBROZIPP Order No 236.001</p>	E 109	 <p>263.1. Blade Precision Ejectors Hardened</p>	E 120





# Contents


## Page

 263.8. Hotwork Blade Precision Ejectors – Nitrided E 121

 264.1. Precision-Ejector Sleeves – Hardened DIN ISO 8405 E 122

 264.8. Hotwork Precision Ejector Sleeves – Nitrided DIN ISO 8405 E 123


 240. High-Precision Gauge Pins DIN 2269 E 124–E 125  
Accessories:  
Wooden Boxes for Gauge Pins

 240.11. High Precision Gauge Pins with Handle E 126

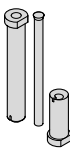
 240.22. High Precision Gauge Pins – Boxed Sets E 126

 240.31. High Precision Gauge Pins – Boxed Sets E 126

 240.32. High Precision Gauge Pins – Boxed Sets E 126

 2280.01. Date stamp, complete E 127–E 128

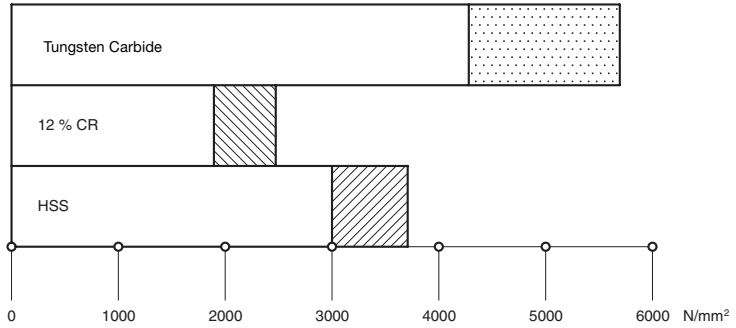
 2280.02. embossed lettering standard and short version E 127–E 128

 2282.01. Punching and embossing unit for punched holes E 129

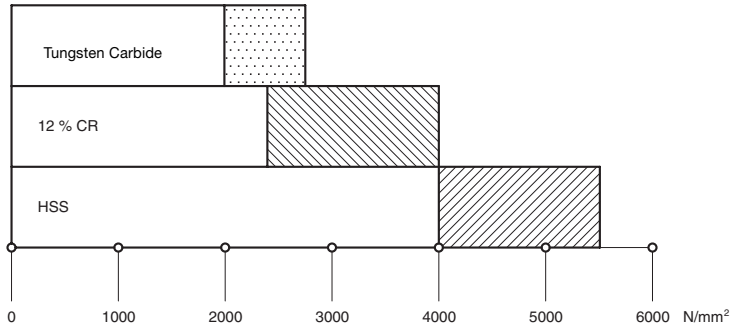


# Comparative Graphs

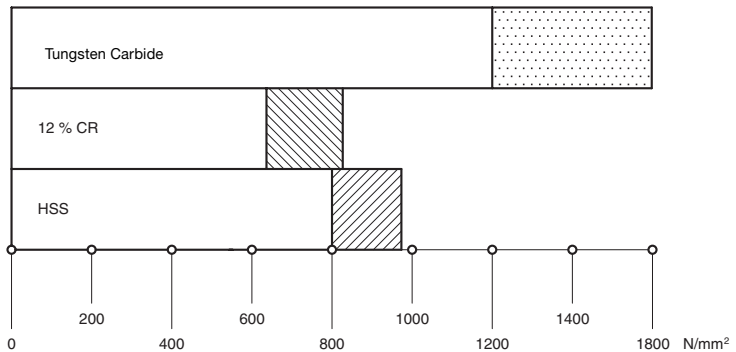
## Compressive Strength (0,2% Proof Stress)



## Flexural Strength



## HV 30 – Hardness



# FIBRO Punches and Matrixes – Description of Materials



**WS** = Alloy Tool Steel  
Material No 1.2210, 1.2516, 1.2842 or similar.  
Characteristics: Hard and tough tool steel, medium wear resistance.  
Application Field: Piercing/blanking dies for mild steel, low carbon steels, non-ferrous metals, plastics, paper.  
**WS** = material code number = "1"  
e.g. Order No = 239.1. ...

**HWS** = High Carbon – High Chrome Tool Steel (12% Cr)  
Material No 1.2436, 1.2379 or similar.  
Characteristics: High resistance to wear.  
Application Field: Piercing/blanking dies of all types, trim dies, for all carbon steels, alloy steels, non-ferrous metals, plastics, paper.  
**HWS** = material code number = "2"  
e.g. Order No = 260.2. ...

**HSS** = High Speed Steel  
Material No 1.3343 or similar.  
Characteristics: High wear resistance; high tempering curve permits certain surface treatments.  
Application Field: Piercing/blanking dies of all types – for tough materials e.g. spring steel, lamination steels, and abrasive papers as well as plastics.  
**HSS** = material code number = "3"  
e.g. Order No = 220.3. ...

**ASP 23** = High Speed Steel on Powder-Metallurgic Basis  
**ASP 2023**  
Characteristics: High wear resistance – greater toughness due to excellent homogeneity.  
Application Field: Same as HSS.  
**ASP 23**  
**ASP 2023** = material code number = "6"  
e.g. Order No = 223.6. ...

**HST** = High Speed Steel, Nitrided  
Characteristics: High wear resistance – reduced galling tendency on account of nitrides infused into top layer of material.  
Application Field: Piercing/blanking dies of all types – for very hard and abrasive materials.  
**HST** = material code number = "4"  
e.g. Order No = 223.4. ...

**FT** = Ferro-Tic (Ferro Titanit)  
Characteristics: Between those of HSS and hard metals (tungsten carbides); machinable in the supplied state – hardness conferred by heat treatment.  
Application Field: Fine blanking and progression/lamination dies for large quantities of parts from abrasive, hard materials, also silicon steels and stainless steels.  
**FT** special manufacture  
– on request –



## FIBRO Punches and Matrixes – Description of Materials

### HZ

#### = Hard-coated Tooling Components for High-Performance

HZC Composite Vapour Deposition (CVD) **TIC-TIN** Coating

Carrier Materials:

HSS Material No 1.3207 and 1.3343 etc.

HCHC Material No 1.2379 and 1.2436 etc.

Properties:

The titanium carbide substrate provides a pressure-resistant bond with the carrier metal, while the outer layer of titanium nitride offers the well-known advantages of optimum tribologic behaviour in contact with the stamping stock. By virtue of its outstanding wear resistance, the TIN-layer largely eliminates seizing and cold welding problems in stamping.

Surface Hardness: approx. 3500 HV 0,05

Coating Thickness: 5 to 8 µm approx.

Applications:

All tooling components subject to high demands on wear resistance and performance, especially punches in progression/combination tools, as well as cold extrusion punches etc. Owing to distortion problems, TIC-TIN is not recommended for parts with a length/thickness ratio than 20:1.

**TIC-TIN** = material code number = "5"

e. g. Order No = 223.5 ...

HZN Titanium Nitride Coating **TIN-PVD** (physical vapour deposition).

Carrier Material:

HSS Material No 1.3207 and 1.3343 etc.

HCHC Material No 1.2379

(HCHC-steels are of conditional suitability)

Properties:

The TIN-coating offers excellent frictional characteristics but its compressive strength remains inferior to TIC-TIN deposits. The TIN-deposition process can be applied to partial, selected areas of the tooling component.

Surface Hardness: approx. 2300 HV 0,05

Coating Thickness: 2-4 µm < Ø 20 = 1,5 µm ± 20 %

Applications:

Tooling for thin stamping stock such as cold rolled spring steel, zinc-galvanized sheet and strip, copper-beryllium bronze, german silver, and solenoid lamination steels.

Note that the ratio stock thickness to punch point diameter should not exceed 1:3.

**TIN** = material code number = "0"

e. g. Order No = 223.0 ...

### HM

#### = Tungsten Carbide

Characteristics:

Hard-sintered carbide on WC-basis and of recognized properties; produced by powder-metallurgic processes, FIBRO's exclusively used HIP-densified carbide exhibits much enhanced flexural strength and reduced residual porosity.

Application Field:

Die components for highest performance and very large stamping volumes – for altogether ultimate demands on tool life.

**HM** = material code number = "9"

e. g. Order No = 270.9 ...

### NWA

#### = Hot-Work Tool Steel – Suitable for Nitriding

Material No 1.2344 or similar.

Characteristics:

Chrome-Molybdenum-Vanadium hot working die steel; core strength: > 1400 N/mm<sup>2</sup>; temperature resistant up to 650°C; surface hardness (nitrided) ≥ 950 HV 0,3.

Application Field:

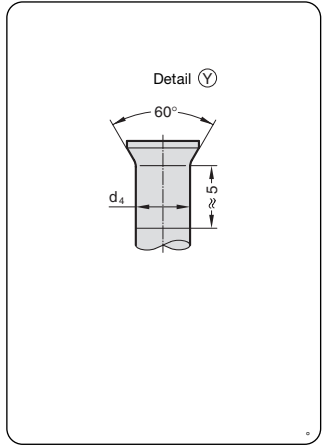
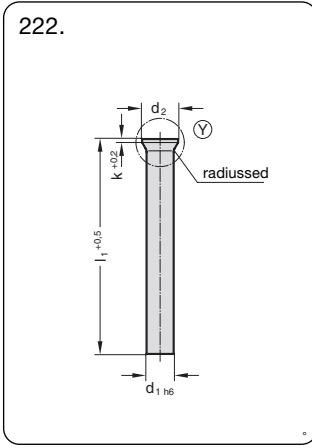
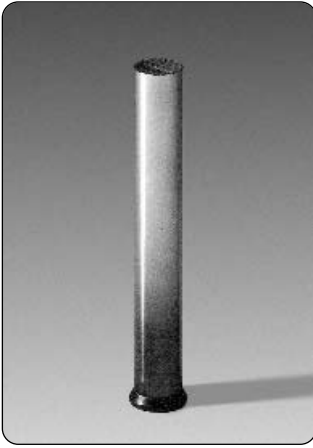
Ejector pins for pressure diecasting, injection- and compression moulding processes, and generally for work at elevated temperatures.

**NWA** = material code number = "8"

e. g. Order No = 237.8 ...

# Precision Punches DIN 9861 Shape DA

222.



## Material:

HSS  
Order-No: 222.3.  
Hardness: Shank 64±2 HRC  
Head 52±3 HRC

HST  
Order-No: 222.4.  
Hardness: Surface ≧950 HV 0,3  
Head 52±3 HRC

Description of FIBRO materials for die components:  
pages E 10–E 11.

## Material:

HZ – TIN (HSS)  
Order-No: 222.0.  
Hardness: Surface 2300 HV 0,05  
Head 52±3 HRC

## Note:

Punches are also available without head

## Type DA – Execution:

Shank precision ground.  
Head hot upset-forged and tempered. Residual upset bulge below head normally much smaller than permissible acc. to DIN 9861.

222. diameter steps				
d <sub>1</sub>	d <sub>1</sub>	d <sub>2</sub>	d <sub>4</sub>	k
0,50	0,05	0,9	d <sub>1</sub> +0,02	0,2
0,55		1,0		
0,60		1,1		
0,65		1,2		
0,70 + 0,75		1,3		
0,80 + 0,85		1,4		0,4
0,90 + 0,95		1,6		
1,0 + 1,1	0,1	1,8	d <sub>1</sub> +0,03	0,5
1,2 + 1,3		2,0		
1,4 + 1,5		2,2		
1,6 + 1,7		2,5		
1,8 + 1,9		2,8		
2,0		3,0		
2,1 + 2,2		3,2		
2,3 – 2,5		3,5		
2,6 – 2,9		4,0		
3,0 – 3,4		4,5		
3,5 – 3,9		5,0		
4,0 – 4,4		5,5		

l<sub>1</sub>  
stock lengths: 71, 80, 100 mm.  
other lengths and diameters on request!

222. diameter steps					
d <sub>1</sub>	d <sub>1</sub>	d <sub>2</sub>	d <sub>4</sub>	k	l <sub>1</sub>
4,5 – 4,9	0,1	6,0	d <sub>1</sub> +0,03	0,5	
5,0 – 5,4		6,5			
5,5 – 5,9		7,0			
6,0 – 6,4		8,0			
6,5 + 7,0	0,5	9,0		1,0	
7,5 + 8,0		10,0			
8,5 + 9,0		11,0			
9,5 + 10,0		12,0			
10,5 + 11,0		13,0			
11,5 + 12,0		14,0			
12,5 + 13,0		15,0			
13,5 + 14,0		16,0		1,5	
14,5 + 15,0		17,0			
15,5 + 16,0		18,0			

stock lengths: 71, 80, 100 mm.  
other lengths and diameters on request!

Ordering Code:

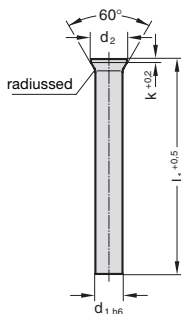
Punch = 222.  
Material HSS = 3.  
d<sub>1</sub> = ∅ 6.30 mm = 0630.  
l<sub>1</sub> = 71 mm = 071  
Order No = 222.3.0630.071



223.

# Precision Punches DIN 9861 Shape D/ISO 6752

223.



## Material:

HSS

Order No: 223.3.  
Hardness: Shank 64±2 HRC  
Head 52±3 HRC

HST

Order No: 223.4.  
Hardness: Surface ≧950 HV 0,3  
Head 52±3 HRC

HZ - TIN (HSS)

Order No: 223.0.  
Hardness: Surface 2300 HV 0,05  
Head 52±3 HRC

ASP 23-ASP 2023

Order No: 223.6.  
Hardness: Shank 64±2 HRC  
Head 52±3 HRC

## Type D – Execution:

Head hot upset-forged and tempered.  
Shank and head subsequently precision plunge-ground for perfect concentricity and full interchangeability with replacement punches.

Description of FIBRO materials for die components:  
pages E 10–E 11.

223.

diameter steps

d <sub>1</sub>	d <sub>1</sub>	d <sub>2</sub>	k	l <sub>1</sub>
0,50	0,05	0,9	0,2	
0,55		1,0		
0,60		1,1		
0,65		1,2		
0,70 +0,75		1,3		
0,80 +0,85		1,4	0,4	
0,90 +0,95		1,6		
1,0 +1,1	0,1	1,8	0,5	
1,2 +1,3		2,0		
1,4 +1,5		2,2		
1,6 +1,7		2,5		
1,8 +1,9		2,8		
2,0		3,0		
2,1 +2,2		3,2		
2,3 -2,5		3,5		
2,6 -2,9		4,0		
3,0 -3,4		4,5		
3,5 -3,9		5,0		
4,0 -4,4		5,5		
4,5 -4,9	0,1	6,0		
5,0 -5,4		6,5		
5,5 -5,9		7,0		

stock lengths: 71, 80, 100 mm;  
other lengths and diameters on request.

223.

diameter steps

d <sub>1</sub> h6	d <sub>1</sub>	d <sub>2</sub>	k	l <sub>1</sub>
6,0 - 6,4	0,1	8,0	0,5	
6,5 + 7,0	0,5	9,0	1,0	
7,5 + 8,0		10,0		
8,5 + 9,0		11,0		
9,5 +10,0		12,0		
10,5 +11,0		13,0		
11,5 +12,0		14,0		
12,5 +13,0		15,0		
13,5 +14,0		16,0	1,5	
14,5 +15,0		17,0		
15,5 +16,0		18,0		
16,5 +17,0		19,0		
17,5 +18,0		20,0		
18,5 +19,0		21,0		
19,5 +20,0		22,0		

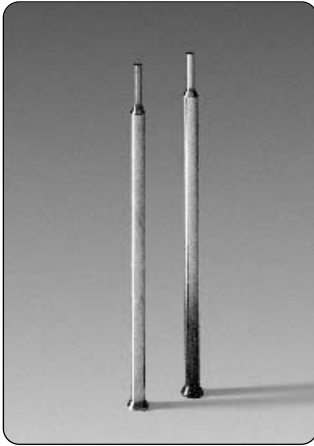
stock lengths: 71, 80, 100 mm;  
other lengths and diameters on request.

## Ordering Code (example):

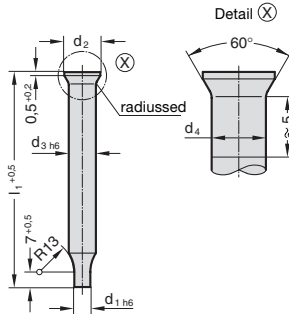
Punch = 223.  
Material HSS = 3.  
d<sub>1</sub> = ∅ 16,5 mm = 1650.  
l<sub>1</sub> = 80 mm = 080  
Order No = 223.3.1650.080

# Precision Punches DIN 9861 Shape CA and C

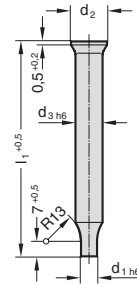
224.  
225.



224. Shape CA



225. Shape C



### Material:

HSS  
Order No: Shape CA = 224.3., Shape C = 225.3.  
Hardness:     Shank     64±2 HRC  
                  Head     52±3 HRC

HST  
Order No:             Shape C = 225.4.  
Hardness:     Surface     ≥950 HV 0,3  
                  Head     52±3 HRC

Description of FIBRO materials for die components:  
pages E 10 – E 11.

### Material:

HZ – TIN (HSS)  
Order No:             Shape CA = 224.0., Shape C = 225.0.  
Hardness:     Surface     2300 HV 0,05  
                  Head     52±3 HRC

ASP 23–ASP 2023  
Order No:             Shape C = 225.6.  
Hardness:     Shank     64±2 HRC  
                  Head     52±3 HRC

### Executions:

Shape CA  
Shank precision ground, head subsequently hot upset-forged and tempered; residual upset-buge below head normally much smaller than permissible acc. to DIN 9861.

Shape C  
Head hot upset-forged and tempered.  
Shank and head subsequently precision plunge-ground for perfect concentricity and full interchangeability with replacement punches.

224. diameter steps					
d <sub>1</sub>	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>4</sub>	l <sub>1</sub>
0,1–0,45	0,05	3	2	d <sub>3</sub> +0,03	
0,50					
0,55					
0,60					
0,65					
0,70 + 0,75					
0,80 + 0,85					
0,90 + 0,95					
1,00 – 1,10					
1,15 – 1,30					
1,35 – 1,50					
1,55 – 1,70		4,5	3		
1,75 – 1,90					
1,95 – 2,00					
2,05 – 2,20					
2,25 – 2,50					
2,55 – 2,95					

stock lengths: 71 mm.  
other lengths and diameters  
on request.

225. diameter steps					
d <sub>1</sub>	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	l <sub>1</sub>	
0,1–0,45	0,05	3	2		
0,50					
0,55					
0,60					
0,65					
0,70 + 0,75					
0,80 + 0,85					
0,90 + 0,95					
1,00 – 1,10					
1,15 – 1,30					
1,35 – 1,50					
1,55 – 1,70		4,5	3		
1,75 – 1,90					
1,95 – 2,00					
2,05 – 2,20					
2,25 – 2,50					
2,55 – 2,95					

stock lengths: 71 mm.  
other lengths and diameters  
on request.

**Ordering Code (example):**

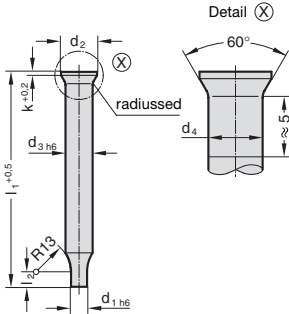
Punch C	=	225.
Material HSS	=	3.
d <sub>1</sub> = ∅ 2,30 mm	=	0230.
l <sub>1</sub> = 71 mm	=	071
Order No	=	225.3.0230.071



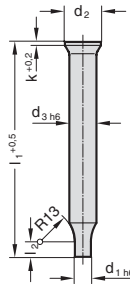
274.  
275.

# Precision Punches Similar to DIN 9861 Shape CA+C

## 274. Shape CA



## 275. Shape C



### Material:

HSS

Order No: Shape CA = 274.3., Shape C = 275.3.  
Hardness: Shank Head 64±2 HRC 52±3 HRC

HST

Order No: Shape CA = 274.4., Shape C = 275.4.  
Hardness: Surface Head ≧950 HV 0,3 52±3 HRC

Description of FIBRO materials for die components:  
pages E 10–E 11.

### Material:

HZ – TIN (HSS)

Order No: Shape CA = 274.0., Shape C = 275.0.  
Hardness: Surface Head 2300 HV 0,05 52±3 HRC

ASP 23–ASP 2023

Order No: Shape C = 275.6.  
Hardness: Shank Head 64±2 HRC 52±3 HRC

### Execution:

Shape CA

Shank precision ground, head subsequently hot upset-forged and tempered; residual upset-bulge below head normally much smaller than permissible acc. to DIN 9861.

Shape C

head hot upset-forged and tempered.

Shank and head subsequently precision plunge-ground for perfect concentricity and full interchangeability with replacement punches.

### Description of Special Series 274. and 275.

DIN 9861 restricts the range of stepped punches with conical head to shanks of 3 mm max. diameter and points of 2,95 mm max. diameter.

Stepped punches of larger size are, however, quite popular owing to their rigidity and ability to sustain considerable stripping forces.

In accommodation of this demand we supply larger sizes which are ground from stock sizes of the 222.- and 223.-series

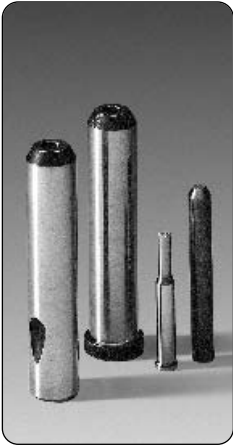
Please select from those ranges and complete your order in accordance with the example on the right.

### Ordering Code (example):

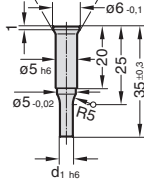
Punch	=	274.
Material HSS	=	3.
d <sub>3</sub> = Ø 8,0 mm	=	0800.
l <sub>1</sub> = 71 mm	=	071.
d <sub>1</sub> = Ø 6,4 mm	=	0640.
l <sub>2</sub> = 10 mm	=	010
Order No	=	274.3.0800.071.0640.010

Stepped Quill Punches – Conical Head  
 Head Type Quill Bush and Thrust Pin  
 Ball Lock Type Quill Bush and Thrust Pin VDI 3374

232.  
 233.  
 234.

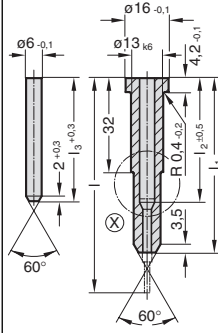


232.



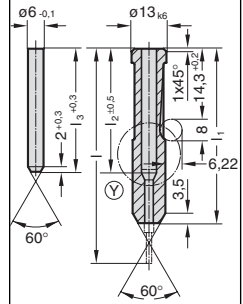
VDI 3374

233. Shape A



VDI 3374

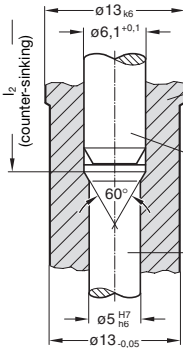
234. Shape B



VDI 3374

233.

Detail X



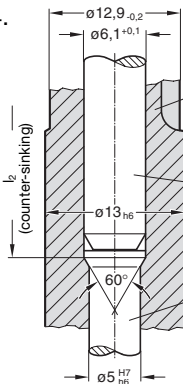
Head Type Quill Bush with Thrust Pin Order No 233.

Thrust Pin

Stepped Quill Punch with Conical Head Order No 232.

234.

Detail Y



Ball Lock Type Quill Bush with Thrust Pin Order No 234.

Thrust Pin

Stepped Quill Punch with Conical Head Order No 232.

**Material:**

Stepped Quill Punches – Conical Head VDI 3374:

HSS  
 Order No: 232.3.  
 Hardness: Shank 62±2 HRC  
 Head 45±5 HRC

Quill Bushes O. No. 233. and 234. – VDI:  
 Steel C 45 heat treated to 800 N/mm<sup>2</sup>  
 Order No: Shape A = 233.7., Shape B = 234.7.

Thrust Pin:  
 HWS  
 Hardness: 62±2 HRC

**Execution:**

Heads of Quill Punches hot upset-forged; shank and head subsequently precision plunge-ground.  
 O. D. of Quill Bushes precision ground.  
 Thrust Pins are hardened, tempered and ground.  
 Description of FIBRO materials for die components: pages E 10 – E 11.

**232./233./234.**

diameter steps					
$d_1$	$d_1$	$l$	$l_1$	$l_2$	$l_3$
from 2,0 to 5,0	0,1	63	48	29	29
		71	57	37	37
		80	65	46	46

**Ordering Code (example):**

Stepped Quill Punch/Conical Head = 232.  
 Material HSS = 3.  
 $d_1 = \varnothing 2,2$  mm = 0220  
 Order No = 232.3.0220

**Ordering Code (example):**

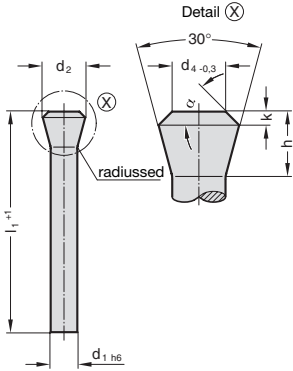
Head Shape Quill Bush + Thrust Pin = 233.  
 Material C 45 = 7.  
 $l_1 = 48$  mm = 048  
 Order No = 233.7.048



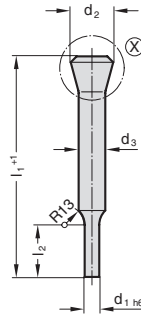
2281.  
2291.

# Round Precision Punches with tapered heads 30°, Shape C and D

## 2281. Shape D



## 2291. Shape C



### Material:

HSS

Order No: Shape D = 2281.3. Shape C = 2291.3.

Hardness: Shank 58 + 2 HRC

Head  $\leq$  50 HRC

Description of FIBRO materials for die components:  
pages E 10–E 11.

### Execution:

Shape C and D

Head hot upset-forged and tempered.

Shank and head subsequently precision plunge-ground for perfect concentricity and full interchangeability with replacement punches.

## 2281. Shape D

$d_1$	$d_2$	$d_4$	$h$	$k$	$\alpha \pm 1^\circ$	$l_1$	
						100	120
5,5	8,98	5,5	7,5	1	30	●	●
6	9,75	6	8		28	●	●
8	12,8	8	10		22,5	●	●
9	14,4	9	11		20	●	●
10	15,9	10	12		19	●	●
12	18,7	12	14	1,5	24	●	●
14	21,8	14	16		21	●	●
16	24,6	16	18	2	25	●	●

## 2291. Shape C

$d_3$	$d_2$	$d_4$	$h$	$k$	$\alpha \pm 1^\circ$	$l_1$	
						100	120
5,5	8,98	5,5	7,5	1	30	●	●
6	9,75	6	8		28	●	●
8	12,8	8	10		22,5	●	●
9	14,4	9	11		20	●	●
10	15,9	10	12		19	●	●
12	18,7	12	14	1,5	24	●	●
14	21,8	14	16		21	●	●
16	24,6	16	18	2	25	●	●

$d_1$  and  $l_2$  to customer's specifications!

### Ordering Code (example):

Punch = 2291.  
Material HSS = 3.  
 $d_3$  = 10 mm = 1000.  
 $l_1$  = 120 mm = 120.  
 $d_1$  = 6 mm = 0600.  
 $l_2$  = 15 mm = 015  
Order No = 2291.3.1000.120.0600.015

### Ordering Code (example):

Punch = 2281.  
Material HSS = 3.  
 $d_1$  = 6 mm = 0600.  
 $l_1$  = 100 mm = 100  
Order No = 2281.3.0600.100

# Assembly Guide Lines for Head Type Punches with Round Points



## Description:

Head type punches with round point (DIN 9844) are intended for floating assembly in the punch retainer. Radial guiding is to be provided by the stripper. This type of punch assembly eliminates alignment errors caused by distorted mounting of the die set and faulty press geometry. With punches held in this manner, a clear separation between transmission of perforation force and guiding is achieved. In order to facilitate assembly of punches of different diameters, the height of the heads is standardized to  $4+0,2$  mm (DIN 9844).

## Guide Lines:

(excerpts from DIN 9844, page 5)

$d_1$  max. = stock thickness

stripping force\*, for  $d_1$  from 1 to 5 mm: approx. 20 % of piercing force

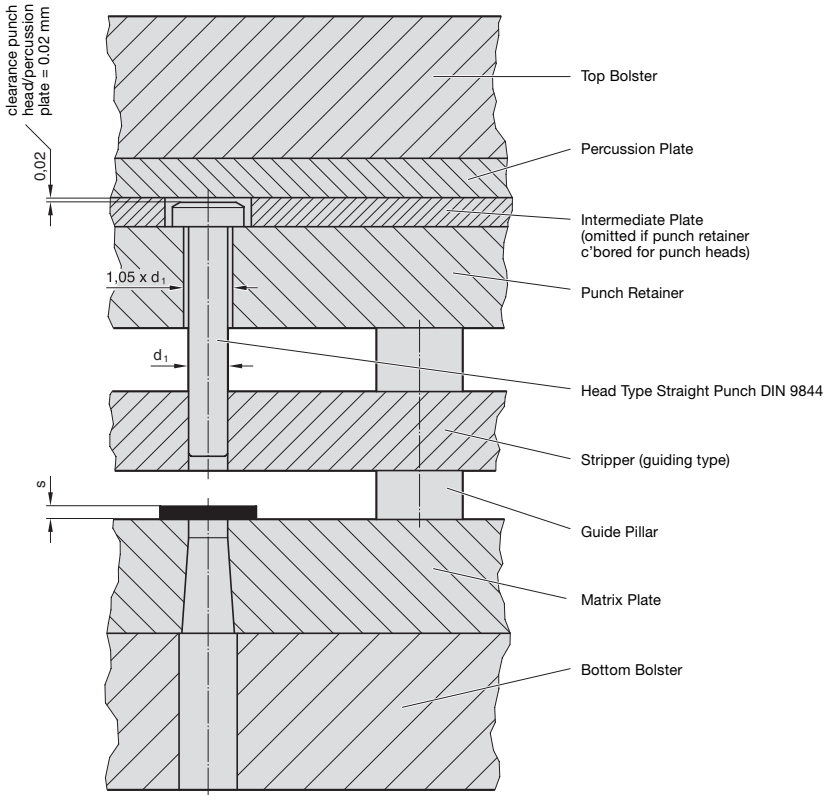
ditto . . . , for  $d_1$  from 5 to 16 mm: approx. 10 % of piercing force

\*applicable to stock not exceeding 400 N/mm<sup>2</sup> shear strength

Punch retainer: steel of at least 300 N/mm<sup>2</sup> tensile strength

Retaining hole in punch retainer = 1,05 times  $d_1$  or  $d_2$  respectively

Clearance punch head/percussion plate = 0,02 mm.

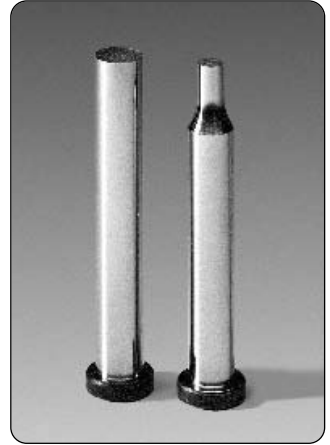
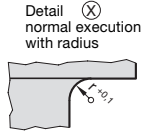
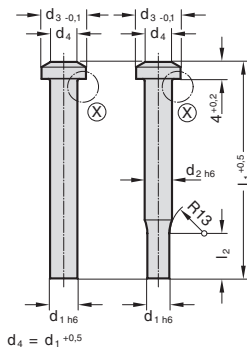




220.  
221.

# Precision Punches DIN 9844 Shape A and B

## 220. Shape A 221. Shape B



### Material:

HSS

Order No: Shape A = 220.3., Shape B = 221.3.  
Hardness: Shank 64±2 HRC  
Head 52±3 HRC

HST

Order No: Shape A = 220.4., Shape B = 221.4.  
Hardness: Surface ≅950 HV 0,3  
Head 52±3 HRC

Description of FIBRO materials for die components:  
pages E 10–E 11.

### Execution:

Head hot upset-forged.  
Shank and shoulder precision plunge-ground.

## 220. Shape A

diameter steps

$d_1$	$d_2$	$d_3$	$r$	$l_1$
2,0 – 2,2	0,1	3,6	0,2	
2,3 – 2,5		4,0		
2,6 – 2,8		4,5	0,3	
2,9 – 3,2		5,0		
3,3 – 3,5		6,0		
3,6 – 4,0		7,0		
4,1 – 4,5		8,0	0,5	
4,6 – 5,0		8,5		
5,1 – 5,4		9,0		
5,5 – 5,9		9,5		
6,0 – 6,4		10,0		
6,5 + 7,0	0,5	10,8	0,7	
7,5 + 8,0		12,0		
8,5 + 9,0		13,0		
9,5 + 10,0		14,5		
10,5 + 11,0		16,0	1,0	
11,5 – 12,5		18,0		
13,0 – 14,5		20,0		
15,0 – 16,0		22,0		

stock lengths: 71, 90, 112 mm;  
other lengths and diameters on request.

## 221. Shape B

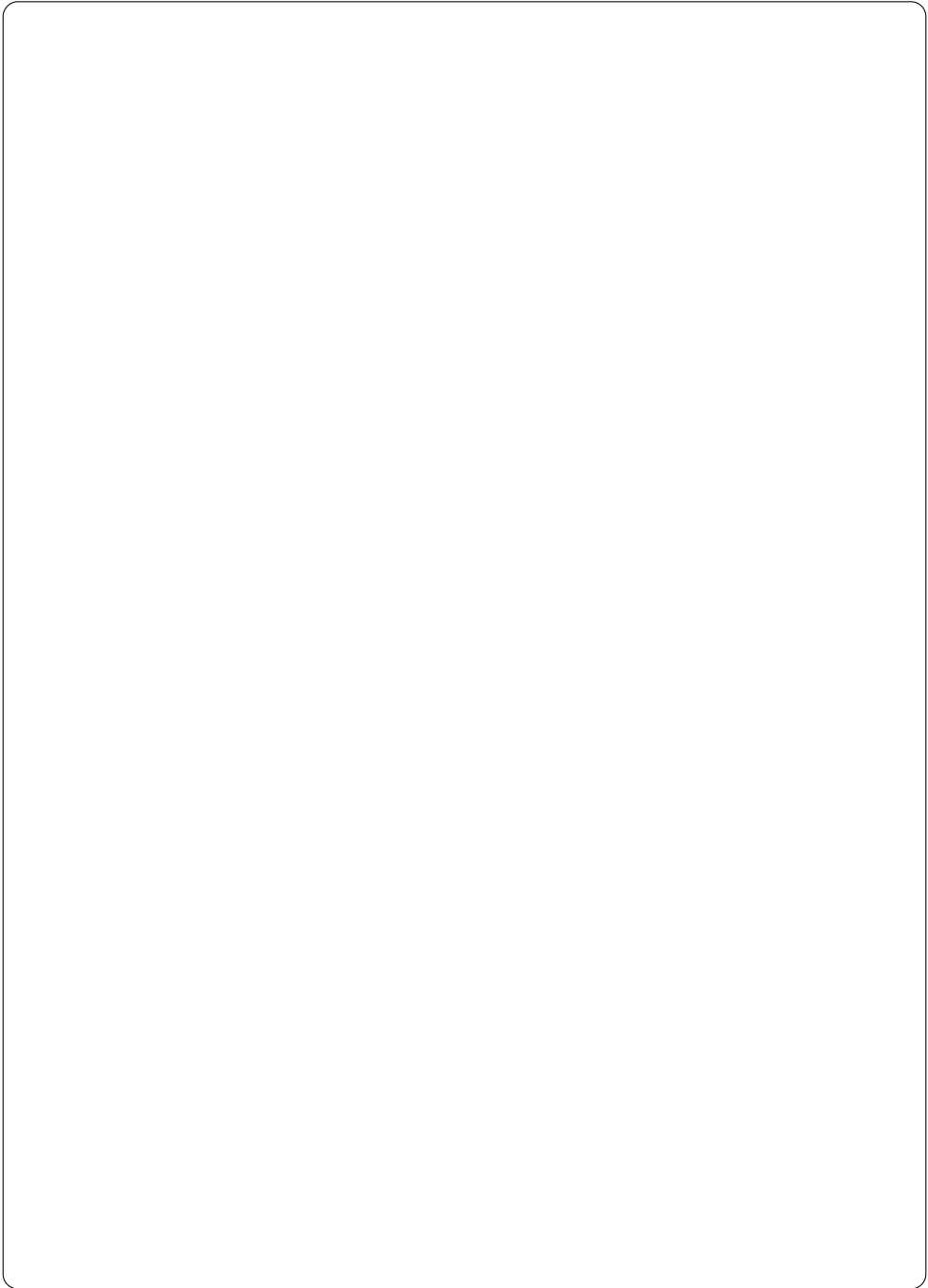
diameter steps

$d_1$	$d_2$	$d_3$	$l_2$	$r$	$l_1$
0,1 – 0,45	0,05	2,0	3,6	7	0,2
0,5 – 1,9					
1,95 – 2,4		2,5	4,0		
2,5 – 3,1	0,1	3,2	5,0		0,3
3,2 – 3,9		4,0	7,0		
4,0 – 4,9		5,0	8,5		0,5
5,0 – 6,2		6,3	10,0		
6,3 – 7,9		8,0	12,0	16	0,7
8,0 – 9,9		10,0	14,5		
10,0 – 12,4		12,5	18,0		1,0
12,5 – 15,9		16,0	22,0		

lengths 71, 90, 112 mm;  
available at short notice;  
other lengths and diameters  
on request.

### Ordering Code (example):

Punch A = 220.  
Punch B = 221.  
Material HSS = 3.  
 $d_1 = \varnothing 7.0$  mm = 0700.  
 $l_1 = 71$  mm = 071  
Order No = 220.3.0700.071  
Order No = 221.3.0700.071

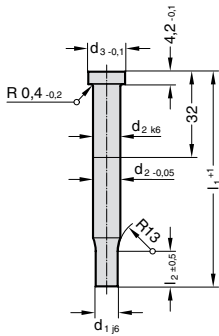




266.

## Precision Punches Similar to VDI 3374

266.



### Material:

HSS  
 Order No: 266.3.  
 Hardness: Shank 62±2 HRC  
 Head 45±5 HRC

### Execution:

Head hot upset-forged; shank and head precision plunge-ground.

Description of FIBRO materials for die components:  
 pages E 10 and E 11.

266.

diameter steps

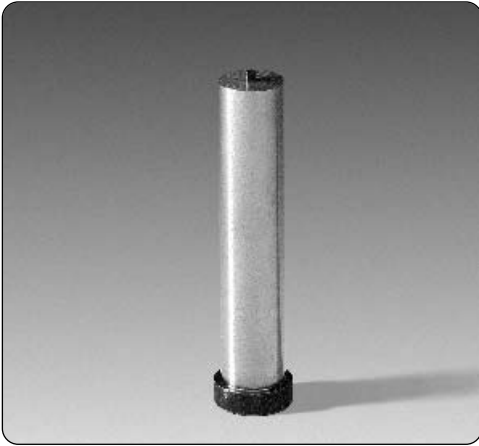
$d_1$	$d_2$	$d_3$	$l_2$	$l_1$	$l_1+1$
5- 8,9	0,1	10	13	13	available at short notice in lengths: 71 and 80 mm; other lengths and dia. on request.
9-11,9		13	16		
12-15,9		16	19		
16-19,9	0,5	20	24		
20-24,9		25	29		

### Ordering Code (example):

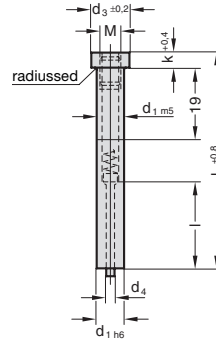
Punch = 266.  
 Material HSS = 3.  
 $d_1 = \varnothing 8,0$  mm = 0800.  
 $l_1 = 71$  mm = 071  
 Order No = 266.3.0800.071

# Precision Punches with Shedder Pin

267.



267.



### Material:

HSS  
 Order No: 267.3.  
 Hardness: Shank 64±2 HRC  
 Head 52±3 HRC

Description of FIBRO materials for die components:  
 pages E 10 and E 11.

### Execution:

Head hot upset-forged.  
 Shank and shoulder precision plunge-ground.

267.

d <sub>1 h6</sub>	d <sub>3</sub>	d <sub>4</sub>	k	l	l <sub>1</sub>			M
					60	71	80	
5	8	0,5	5	13	●	●		M 3
6	9	0,8		19	●		●	●
8	11	1,3		28	●	●	●	●
10	13			32	●		●	●
13	16	1,6			●	●	●	●
16	19	2,4	6,4		●	●	●	●
20	23				●	●	●	●
25	28	3,2			●	●	●	●

### Ordering Code (example):

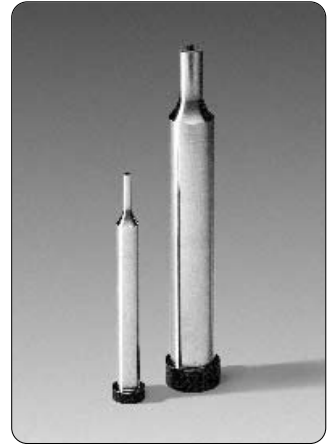
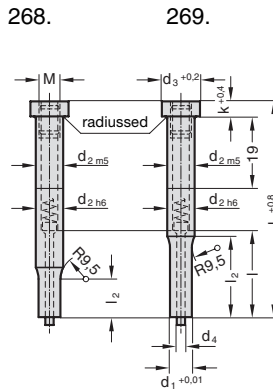
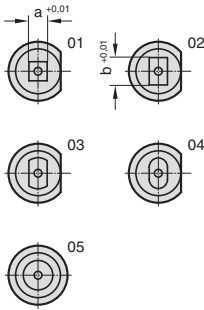
Punch = 267.  
 Material HSS = 3.  
 d<sub>1</sub> = ∅ 8,0 mm = 0800.  
 l<sub>1</sub> = 71 mm = 071  
 Order No = 267.3.0800.071



268.  
269.

# Precision Punches with Shedder Pin, Stepped, Short/Long Point

## Classified Point Shapes



## Material:

HSS

Order No: 268.3. (short point)  
Hardness: Shank 64±2 HRC  
Head 52±3 HRC

HSS

Order No: 269.3. (long point)  
Hardness: Shank 64±2 HRC  
Head 52±3 HRC

## Execution:

Head hot upset-forged.  
Shank and shoulder precision plunge-ground.

Key flats parallel with longest size of shape, unless otherwise specified.

Description of FIBRO materials for die components:  
pages E 10 and E 11.

268./269.

268. 269.

d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>4</sub>	k	l	l <sub>2</sub>	l <sub>2</sub>	60	71	l <sub>1</sub> 80	90	a min.	M
1,6 - 4,9	5	8	0,5	5	13	7	-	●	●			1,6	M 3
2,3 - 5,9	6	9	0,8		19		17,5	●	●	●	●	2,3	
3,5 - 7,9	8	11	1,3		28	13	25	●	●	●	●	3,2	M 4
5,0 - 9,9	10	13			32		28	●	●	●	●	4,8	
6,0 - 12,9	13	16	1,6					●	●	●	●		M 5
8,0 - 15,9	16	19	2,4	6,4				●	●	●	●	5,5	M 6
12,0 - 19,9	20	23						●	●	●	●		
16,0 - 24,9	25	28	3,2					●	●	●	●	6,5	

## Ordering Code (example):

Punch = 268.  
Material HSS = 3.  
d<sub>2</sub> = 8,0 mm = 0800.  
l<sub>1</sub> = 71 mm = 071.  
Classified Point Shape 05 = 05.  
d<sub>1</sub> = 6,0 mm = 0600  
Order No = 268.3.0800.071.05.0600

# Sintered Hard Metal HIP-Densified



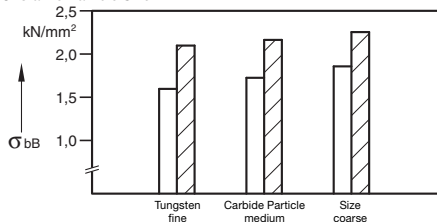
The HIP Process (hot isostatic pressing) consists of a special densification treatment.

Applied after the sintering stage, this widely used process involves compacting, at very high temperature and pressure, of the carbide structure. It yields an appreciable reduction in porosity, better strength properties and thus longer die life of press tool members.

As can be seen from the diagrams and tables, both compressive and flexural strength are improved.

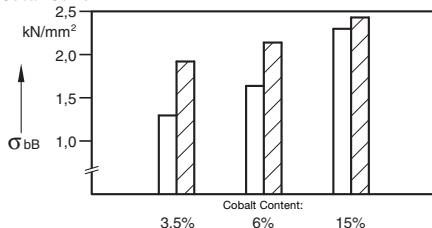
For stamping die tooling, hard metal types of medium tungsten particle size, with a cobalt content of 9 to 12%, have been found successful in a wide field of applications.

Tensile Strength of Tungsten – 6% Cobalt Carbide in the Sintered-Only versus HIP-Densified State, in Dependence of Crystallite Particle Size



a) influence of crystallite size of hard metal phase (left: sintered only – right: sintered and HIP-treated)

Tensile Strength of Tungsten – Cobalt Carbide in the Sintered-Only versus HIP-Densified State, in Dependence of total Cobalt Content



b) influence of cobalt content (left: sintered only – right: sintered and HIP-treated)

Tungsten carbide particle size	Co %	HV <sub>30</sub> -Hardness		Flexural Strength N/mm²	
		before	after	before	after
fine	3	1800	no changes	1200	1700
	6	1650		1500	2300
	9	1400		2000	2600
medium	6	1600		2000	2600
	9	1450		2350	2700
	12	1300		2450	2900
	15	1200		2700	2850
coarse	6	1400		1900	2250
	8	1350		2300	2600
	10	1200	2650	2850	

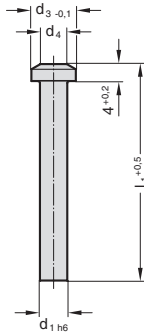
Flexural Strength and HV<sub>30</sub>-Hardness of Tungsten-Cobalt Carbides with/without HIP-Treatment and in Dependence of Tungsten Carbide Particle Size and Cobalt Content.



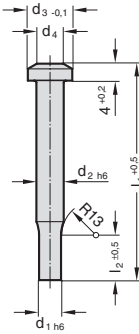
270. 272.  
271. 273.

Carbide Punches – similar to DIN 9844 + DIN 9861  
Cylindrical Head – Straight and Stepped  
Conical Head – Straight and Stepped

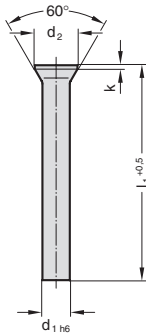
270. Shape A



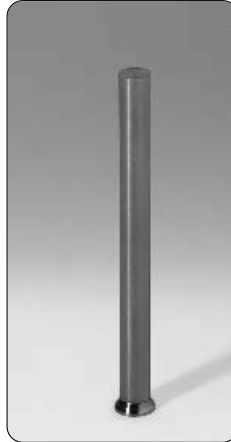
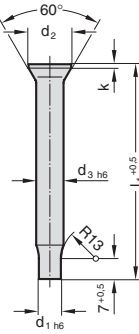
271. Shape B



272. Shape D



273. Shape C



**Material:**

Tungsten-Cobalt Carbide

Order No:     Shape A = 270.9., Shape B = 271.9.  
                  Shape D = 272.9., Shape C = 273.9.

**Dimensions:**

See DIN 9844 and DIN 9861 on pages E 12, E 13, E 14, E 15 and E 19.  
Other diameters and lengths on request.

**Delivery:**

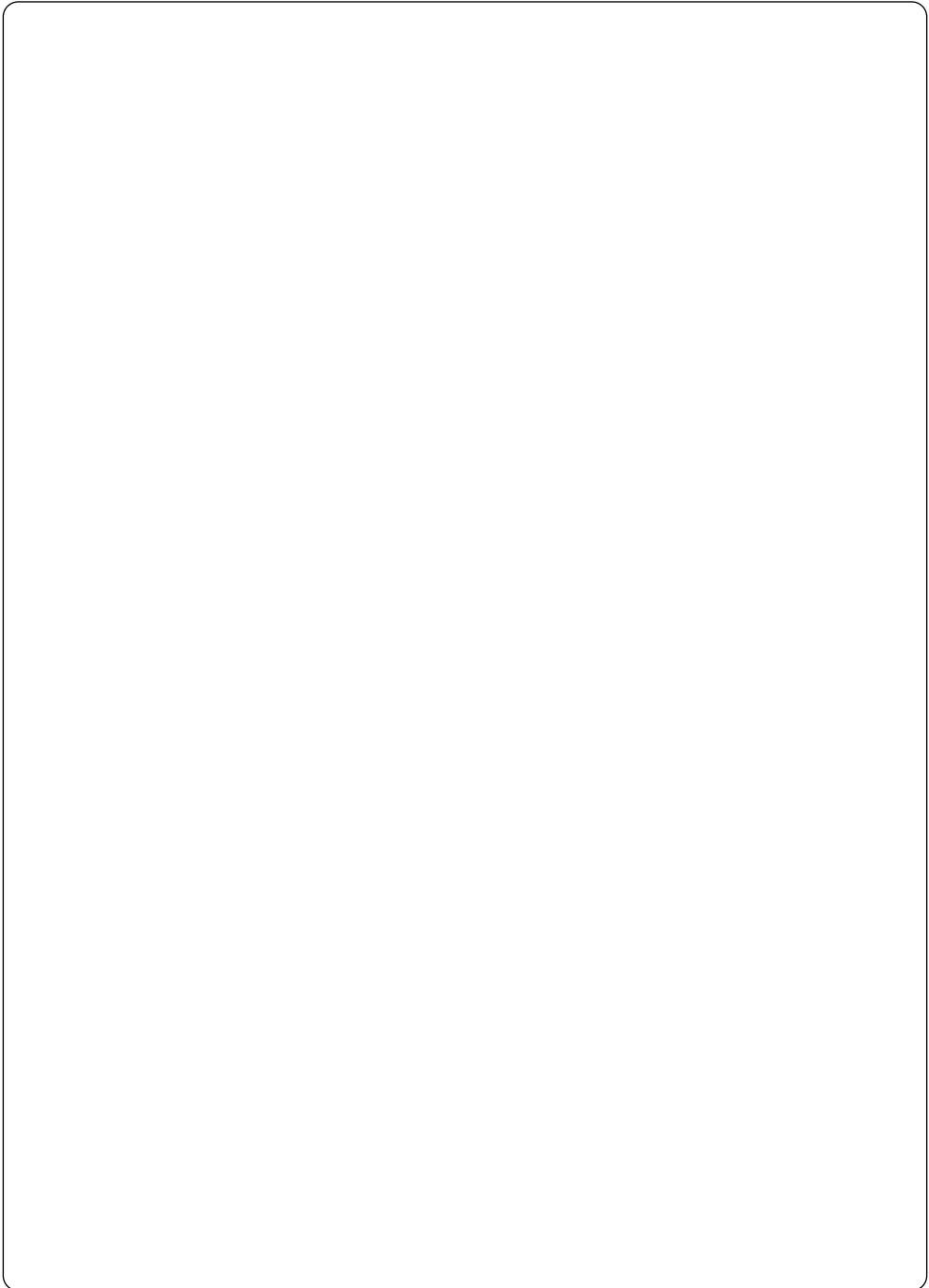
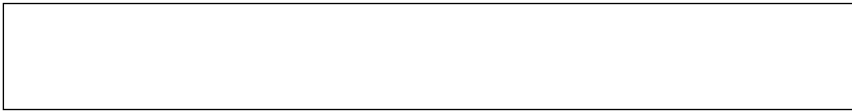
270.  
Shape A from  $d_1 = 1,0$  mm  
272.  
Shape D from  $d_1 = 1,5$  mm

**Execution:**

Heads steel, brazed to shanks.  
Shanks precision ground.

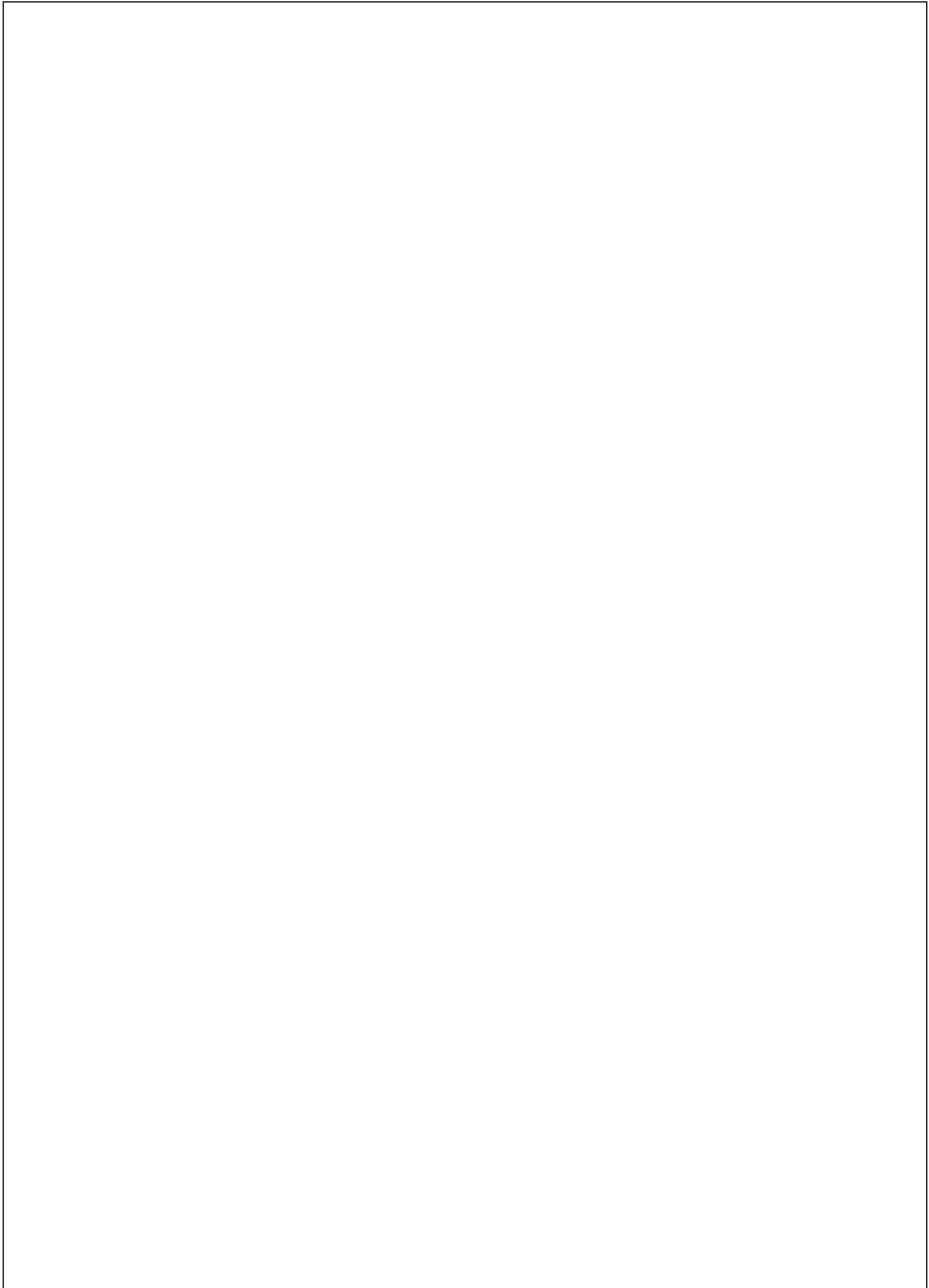
**Ordering Code (example):**

Carbide Punch	= 272.
Material: Tungsten-Cobalt Carbide	= 9.
$d_1 = \varnothing 6,0$ mm	= 0600.
$l_1 = 71$ mm	= 071
Order No	= 272.9.0600.071





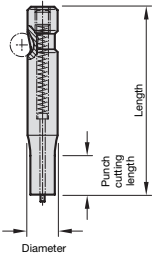
# Ball-lock Punches



# Ordering example Ball-lock punches



**NB:** See table for standard dimensions  
Special dimensions to order



Punch:  
22 without ejector pin  
27 with ejector pin

2 2 4 2 . 2 F 1 . 0 6 5 0 . 0 4 5 0 A

Punch cutting length: $l_1$	Order No
13	= 1
19	= 2
25	= 3
30	= 4
special	= X

Format: Slot length  $P = 6,5$  mm

Format: Slot width  $W = 4,5$  mm

Version:	Order No
○ blank	= 0
⊙ round	= 1
□ square	= 2
▭ rectangular	= 3
⊖ slot	= 4
▭ rectangle with radiused corners	= 5
▽ pilot pin with tapered tip	= 6
▽ pilot pin parabolic tip	= 7
special shapes	= 9

Diameter: $d_2$	Order No
6 (light duty only)	= 1
10	= 2
13	= 3
16	= 4
20	= 5
25	= 6
32	= 7
38 (light duty only)	= 8
40 (heavy duty only)	= 9

Length: $l$	Order Code character
50	= A
56	= B
63	= C
71	= D
80	= E
90	= F
100	= G
110	= H
125	= J
140	= K
150	= L
175	= M
200	= N
special	= X

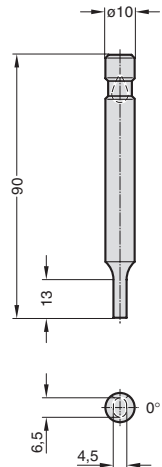
Angle:	Order Code character
0°	= A
90°	= B
180°	= C
270°	= D
special	= X

Type:	Order No
light	= 2
heavy	= 3
punch larger, light	= 4
punch larger, heavy	= 5

## Ordering Code (Example):

2 2 4 2 . 2 F 1 . 0 6 5 0 . 0 4 5 0 A

- Angle = 0° (A)
- Format: Slot, width  $W = 4,5$  mm (0450)
- Format: Slot, length  $P = 6,5$  mm (0650)
- Punch length:  $l_1 = 13$  mm (1)
- Length:  $l = 90$  mm (F)
- Diameter:  $d_2 = 10$  mm (2)
- Type = light (2)
- Version: Slot (4)
- Punch: without ejector pin (22)

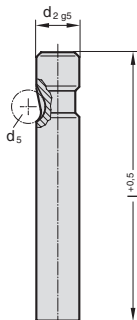


Ball-lock punches, blank, light duty  
 Ball-lock punches, stepped, light duty

2202.  
 2212.



2202.



Material:

HSS  
 hardened: 62 ± 2 HRC

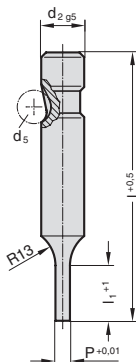
Execution:

Shaft fine ground.

Other lengths on request.



2212.



Material:

HSS  
 hardened: 62 ± 2 HRC

Execution:

Shaft and punch diameter fine ground.

Other lengths an request.

2202.

d <sub>2</sub>	d <sub>5</sub>	63	71	80	90	100	110	125	140	150	175	200
6	6	●	●	●	●	●	●					
10	8	●	●	●	●	●	●	●				
13	8	●	●	●	●	●	●	●	●			
16	8	●	●	●	●	●	●	●	●	●		
20	8	●	●	●	●	●	●	●	●	●	●	
25	8	●	●	●	●	●	●	●	●	●	●	●
32	8		●	●	●	●	●	●	●	●	●	●
38	8			●	●	●	●	●	●	●	●	●

Ordering example:

see fold out page E 29.

2212.

d <sub>2</sub>	d <sub>5</sub>	P	l <sub>1</sub>	63	71	80	90	100
6	6	1,6– 5,9	13*					
10	8	1,6– 9,9	13* 19*	●	●	●	●	●
13	8	5,0– 12,9	13 19	●	●	●	●	●
16	8	8,0– 15,9	13 19 25	●	●	●	●	●
20	8	12,0– 19,9	13 19 25	●	●	●	●	●
25	8	16,0– 24,9	13 19 25	●	●	●	●	●
32	8	24,0– 31,9	13 19 25		●	●	●	●
38	8	30,0– 37,9	19 25 30			●	●	●

\* l<sub>1</sub> = 10 where P < 2,20

Ordering example:

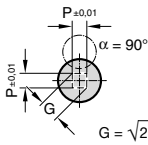
see fold out page E 29.



2222. 2232.  
2242. 2252.

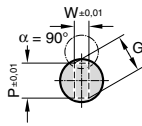
Ball-lock punches,  
stepped, light duty

2222.



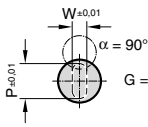
$$G = \sqrt{2} \times P$$

2232.



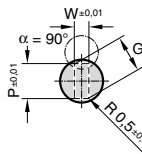
$$G = \sqrt{P^2 + W^2}$$

2242.



$$G = P$$

2252.



$$G = \sqrt{(P-1.0)^2 + (W-1.0)^2} + 1$$

\* For other radius options, see standardised special shapes, pages 82 – 83.



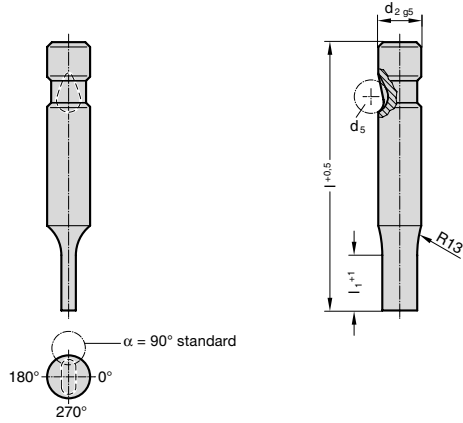
**Material:**

HSS  
hardened: 62 ± 2 HRC

**Execution:**

Shaft and punch shape fine ground.

Other lengths on request.



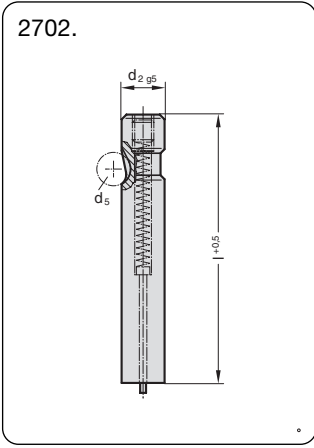
d <sub>2</sub>	d <sub>5</sub>	W <sub>min.</sub>	G <sub>max.</sub>	l <sub>1</sub>	l				
					63	71	80	90	100
6	6	1,6	5,9	13*	●	●	●	●	●
10	8	1,6	9,9	13* 19*	●	●	●	●	●
13	8	4,5	12,9	13 19	●	●	●	●	●
16	8	6,0	15,9	13 19 25	●	●	●	●	●
20	8	8,0	19,9	13 19 25	●	●	●	●	●
25	8	10,0	24,9	13 19 25	●	●	●	●	●
32	8	12,5	31,9	13 19 25	●	●	●	●	●
38	8	14,0	37,9	19 25 30	●	●	●	●	●

\* l<sub>1</sub> = 10 where P or W < 2,20

**Ordering example:**

see fold out page 8 29.

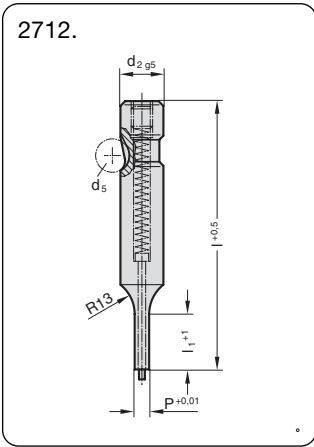
Ball-lock punches, blank with ejector pin, light duty (replaces 2672.) 2702.  
 Ball-lock punches, stepped with ejector pin, light duty (replaces 2682.) 2712.



**Material:**  
 HSS  
 hardened: 62 ± 2 HRC

**Execution:**  
 Shaft fine ground.

Other lengths on request.



**Material:**  
 HSS  
 hardened: 62 ± 2 HRC

**Execution:**  
 Shaft and punch diameter fine ground.

Other lengths on request.

2702.

d <sub>2</sub>	d <sub>5</sub>	63	71	80	90	100
6	6	●	●	●	●	●
10	8	●	●	●	●	●
13	8	●	●	●	●	●
16	8	●	●	●	●	●
20	8	●	●	●	●	●
25	8	●	●	●	●	●
32	8	●	●	●	●	●
38	8	●	●	●	●	●

Ordering example:  
 see fold out page E 29.

2712.

d <sub>2</sub>	d <sub>5</sub>	P	l <sub>1</sub>	63	71	80	90	100
6	6	1,6– 5,9	13*	●	●	●	●	●
10	8	1,6– 9,9	13* 19*	●	●	●	●	●
13	8	5,0– 12,9	13 19	●	●	●	●	●
16	8	8,0– 15,9	13 19 25	●	●	●	●	●
20	8	12,0– 19,9	13 19 25	●	●	●	●	●
25	8	16,0– 24,9	13 19 25	●	●	●	●	●
32	8	24,0– 31,9	13 19 25	●	●	●	●	●
38	8	30,0– 37,9	19 25 30	●	●	●	●	●

\* l<sub>1</sub> = 10 where P < 2,20

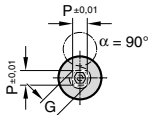
Ordering example:  
 see fold out page E 29.



2722. 2732.  
2742. 2752.  
replaces 2682.

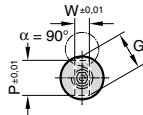
Ball-lock punches,  
stepped with ejector pin, light duty

2722.



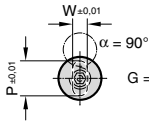
$$G = \sqrt{2} \times P$$

2732.



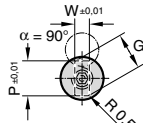
$$G = \sqrt{P^2 + W^2}$$

2742.



$$G = P$$

2752.



$$G = \sqrt{(P-1.0)^2 + (W-1.0)^2} + 1$$

\* For other radius options, see standardised special shapes, pages E 82 – E 83.



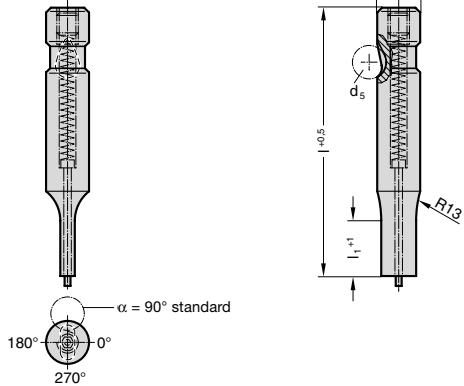
**Material:**

HSS  
hardened: 62 ± 2 HRC

**Execution:**

Shaft and punch shape fine ground.

Other lengths on request.



d <sub>2</sub>	d <sub>5</sub>	W <sub>min.</sub>	G <sub>max.</sub>	M	l <sub>1</sub>	63	71	80	90	100
6	6	1,6	5,9	3	13*	●	●	●	●	●
10	8	1,6	9,9	5	13* 19*	●	●	●	●	●
13	8	4,5	12,9	5	13 19	●	●	●	●	●
16	8	6,0	15,9	6	13 19 25	●	●	●	●	●
20	8	8,0	19,9	6	13 19 25	●	●	●	●	●
25	8	10,0	24,9	6	13 19 25	●	●	●	●	●
32	8	12,5	31,9	8	13 19 25	●	●	●	●	●
38	8	14,0	37,9	8	19 25 30	●	●	●	●	●

\* l<sub>1</sub> = 10 where P or W < 2,20

**Ordering example:**

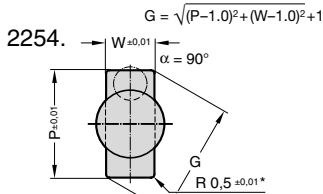
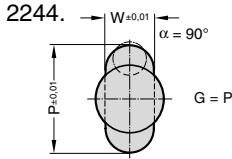
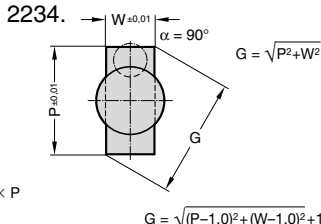
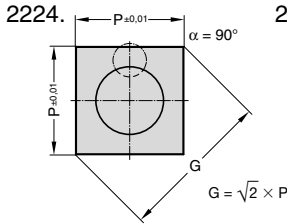
see fold out page E 29.





2224. 2234.  
2244. 2254.

### Ball-lock punches, punch larger than shaft, light duty



\* For other radius options, see standardised special shapes, pages E 82 – E 83.



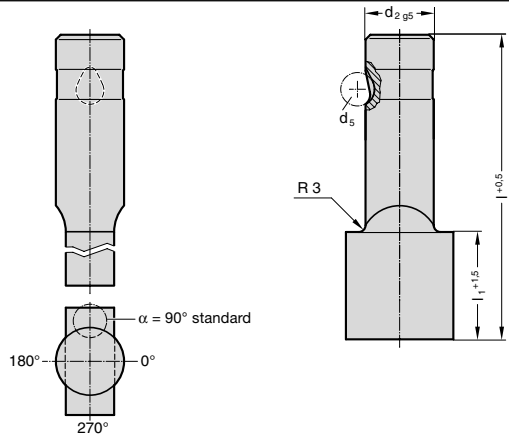
#### Material:

HSS  
hardened: 62 ± 2 HRC

#### Execution:

Shaft and punch shape fine ground.

Other lengths on request.



$d_2$	$d_5$	$W_{min.}$	$G_{max.}$	$l_1$	$l$			
					80	90	100	
13	8	5,0	32,0	19	30	●	●	●
16	8	6,5	38,0	19	30	●	●	●
20	8	8,0	40,0	19	30	●	●	●
25	8	10,0	44,0	19	30	●	●	●
32	8	11,5	50,0	19	30	●	●	●

#### Ordering example:

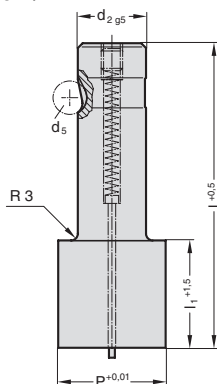
see fold out page E 29.

Ball-lock punches,  
punch larger than shaft,  
light duty with ejector pin

2704.  
2714.



2704./2714.



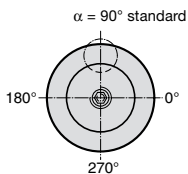
Material:

HSS  
hardened: 62 ± 2 HRC

Execution:

Shaft and punch diameter fine ground.

Other lengths on request.



2704.

d <sub>2</sub>	d <sub>5</sub>	P	l <sub>1</sub>	80	90	100
13	8	32,0	19 30	●	●	●
16	8	38,0	19 30	●	●	●
20	8	40,0	19 30	●	●	●
25	8	44,0	19 30	●	●	●
32	8	50,0	19 30	●	●	●

Ordering example:

see fold out page E 29.

2714.

d <sub>2</sub>	d <sub>5</sub>	P	l <sub>1</sub>	80	90	100
13	8	13,1 – 32,0	19 30	●	●	●
16	8	16,1 – 38,0	19 30	●	●	●
20	8	20,1 – 38,0	19 30	●	●	●
25	8	25,1 – 45,0	19 30	●	●	●
32	8	32,1 – 50,0	19 30	●	●	●

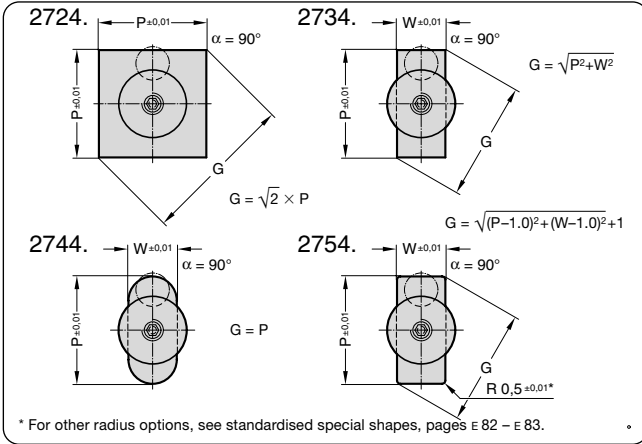
Ordering example:

see fold out page E 29.



2724. 2734.  
2744. 2754.

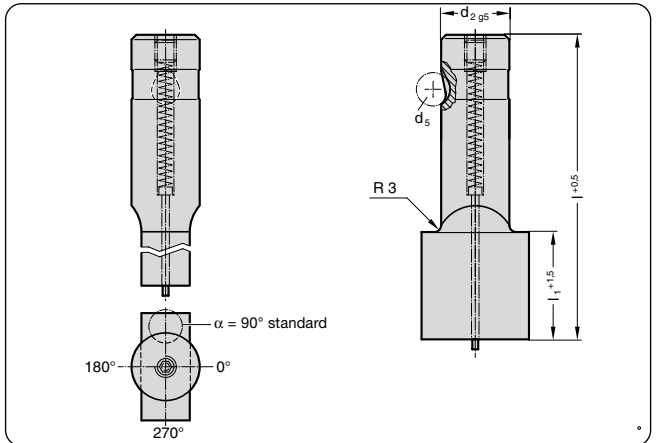
Ball-lock punches,  
punch larger than shaft,  
light duty with ejector pin



**Material:**  
HSS  
hardened: 62 ± 2 HRC

**Execution:**  
Shaft and punch shape fine ground.

Other lengths on request.



d <sub>2</sub>	d <sub>5</sub>	W <sub>min.</sub>	G <sub>max.</sub>	l <sub>1</sub>	l			
					80	90	100	
13	8	5,0	32,0	19	30	●	●	●
16	8	6,5	38,0	19	30	●	●	●
20	8	8,0	40,0	19	30	●	●	●
25	8	10,0	44,0	19	30	●	●	●
32	8	11,5	50,0	19	30	●	●	●

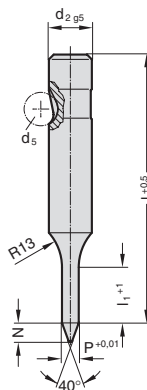
**Ordering example:**  
see fold out page E 29.

# Ball-lock pilot pins, with tapered tip, light duty

2262.



2262.



## Material:

HSS  
hardened: 62 ± 2 HRC

## Execution:

Shaft and pilot pin fine ground.

Other lengths on request.

2262.

$d_2$	$d_5$	P	$I_1$	N	I											
					71	80	90	100	110	125	140	150				
10	8	5,9 – 9,9	19	8	●	●	●	●	●	●	●	●	●	●	●	●
13	8	9,9 – 12,9	19	10	●	●	●	●	●	●	●	●	●	●	●	●
16	8	12,9 – 15,9	25	15	●	●	●	●	●	●	●	●	●	●	●	●
20	8	15,9 – 19,9	25	20	●	●	●	●	●	●	●	●	●	●	●	●
25	8	19,9 – 24,9	25	25	●	●	●	●	●	●	●	●	●	●	●	●
32	8	24,9 – 31,9	25	30	●	●	●	●	●	●	●	●	●	●	●	●
38	8	31,9 – 37,9	30	35	●	●	●	●	●	●	●	●	●	●	●	●

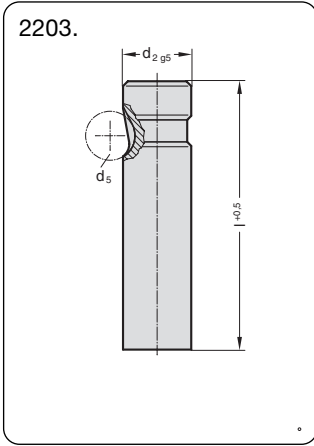
## Ordering example:

see fold out page E 29.



Ball-lock punches, blank, heavy duty  
 Ball-lock punches, stepped, heavy duty

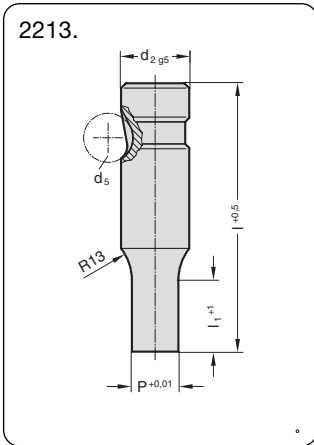
2203.  
 2213.



**Material:**  
 HSS  
 hardened: 62 ± 2 HRC

**Execution:**  
 Shaft fine ground.

Other lengths on request.



**Material:**  
 HSS  
 hardened: 62 ± 2 HRC

**Execution:**  
 Shaft and punch diameter fine ground.

Other lengths on request.

**2203.**

d <sub>2</sub>	d <sub>5</sub>	63	71	80	90	100	110	125	140	150	175	200	l
10	10	●	●	●	●	●	●	●					
13	12	●	●	●	●	●	●	●	●	●	●		
16	12	●	●	●	●	●	●	●	●	●	●		
20	12	●	●	●	●	●	●	●	●	●	●		
25	12	●	●	●	●	●	●	●	●	●	●	●	
32	12	●	●	●	●	●	●	●	●	●	●	●	
40	12		●	●	●	●	●	●	●	●	●	●	

Ordering example:  
 see fold out page E 29.

**2213.**

d <sub>2</sub>	d <sub>5</sub>	P	l <sub>1</sub>	63	71	80	90	100	110	125	l
10	10	1,6- 9,9	13* 19*	●	●	●	●	●	●	●	
13	12	5,0-12,9	13 19	●	●	●	●	●	●	●	
16	12	8,0-15,9	13 19 25	●	●	●	●	●	●	●	
20	12	12,0-19,9	13 19 25	●	●	●	●	●	●	●	
25	12	16,0-24,9	13 19 25	●	●	●	●	●	●	●	
32	12	24,0-31,9	13 19 25	●	●	●	●	●	●	●	
40	12	30,0-39,9	19 25 30	●	●	●	●	●	●	●	

\* l<sub>1</sub> = 10 where P < 2,20

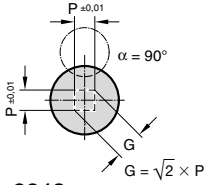
Ordering example:  
 see fold out page E 29.



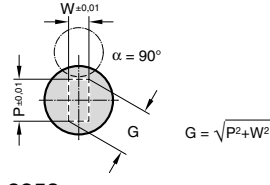
2223. 2233.  
2243. 2253.

Ball-lock punches,  
stepped, heavy duty

2223.

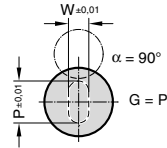


2233.

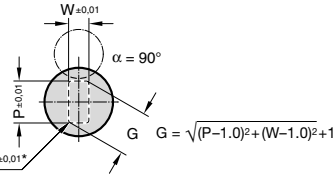


$$G = \sqrt{P^2 + W^2}$$

2243.



2253.



$$G = \sqrt{(P-1.0)^2 + (W-1.0)^2 + 1}$$

\* For other radius options, see standardised special shapes, pages 82 – 83.



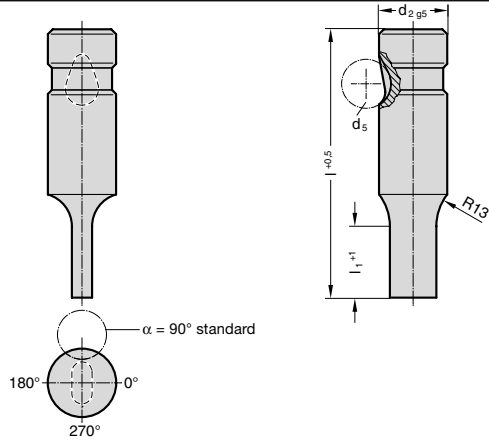
**Material:**

HSS  
hardened: 62 ± 2 HRC

**Execution:**

Shaft and punch shape fine ground.

Other lengths on request.



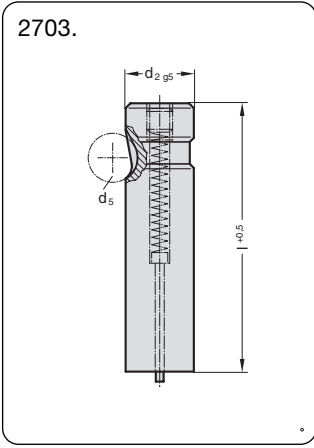
d <sub>2</sub>	d <sub>5</sub>	W <sub>min.</sub>	G <sub>max.</sub>	l <sub>1</sub>	l						
					63	71	80	90	100	110	125
10	10	1,6	9,9	13* 19*	●	●	●	●	●	●	●
13	12	4,5	12,9	13 19	●	●	●	●	●	●	●
16	12	6,0	15,9	13 19 25	●	●	●	●	●	●	●
20	12	8,0	19,9	13 19 25	●	●	●	●	●	●	●
25	12	10,0	24,9	13 19 25	●	●	●	●	●	●	●
32	12	12,5	31,9	13 19 25	●	●	●	●	●	●	●
40	12	14,0	39,9	19 25 30	●	●	●	●	●	●	●

\*l<sub>1</sub> = 10 where P or W < 2,20

**Ordering example:**

see fold out page 29.

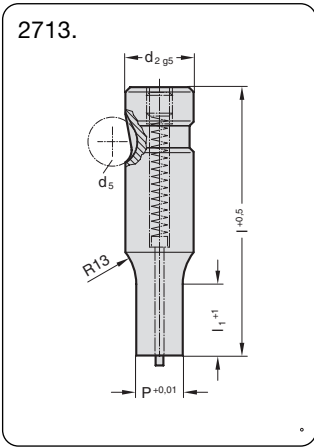
Ball-lock punches, blank with ejector pin, heavy duty (replaces 2673.) 2703.  
 Ball-lock punches, stepped with ejector pin, heavy duty (replaces 2683.) 2713.



**Material:**  
 HSS  
 hardened: 62 ± 2 HRC

**Execution:**  
 Shaft fine ground.

Other lengths on request.



**Material:**  
 HSS  
 hardened: 62 ± 2 HRC

**Execution:**  
 Shaft and punch diameter fine ground.

Other lengths on request.

2703.

d <sub>2</sub>	d <sub>5</sub>	63	71	80	90	100	110	125
10	10	●	●					
13	12	●	●	●	●	●	●	●
16	12	●	●	●	●	●	●	●
20	12	●	●	●	●	●	●	●
25	12		●	●	●	●	●	●
32	12		●	●	●	●	●	●
40	12			●	●	●	●	●

Ordering example:  
 see fold out page E 29.

2713.

d <sub>2</sub>	d <sub>5</sub>	P	l <sub>1</sub>	63	71	80	90	100	110	125
10	10	1,6- 9,9	13* 19*	●	●	●	●	●	●	●
13	12	5,0-12,9	13 19	●	●	●	●	●	●	●
16	12	8,0-15,9	13 19 25	●	●	●	●	●	●	●
20	12	12,0-19,9	13 19 25	●	●	●	●	●	●	●
25	12	16,0-24,9	13 19 25	●	●	●	●	●	●	●
32	12	24,0-31,9	13 19 25	●	●	●	●	●	●	●
40	12	30,0-39,9	19 25 30	●	●	●	●	●	●	●

\* l<sub>1</sub> = 10 mm where P < 2,20

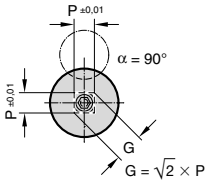
Ordering example:  
 see fold out page E 29.



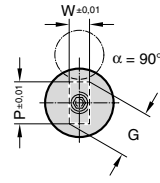
2723. 2733.  
2743. 2753.  
replaces 2683.

Ball-lock punches,  
stepped with ejector pin,  
heavy duty

2723.

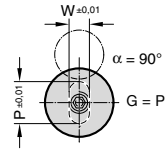


2733.

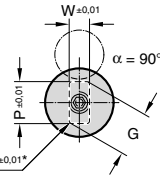


$$G = \sqrt{P^2 + W^2}$$

2743.



2753.



\* For other radius options, see standardised special shapes, pages E 82 - E 83.

$$G = \sqrt{(P-1.0)^2 + (W-1.0)^2} + 1$$



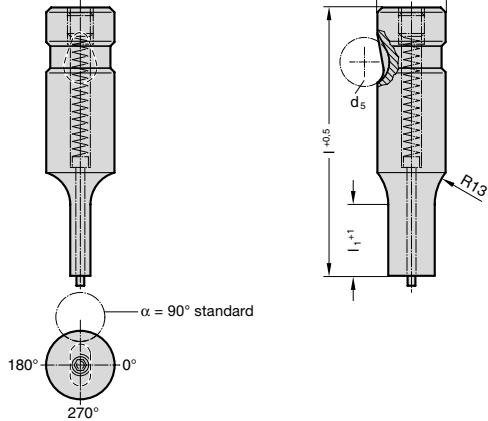
**Material:**

HSS  
hardened: 62 ± 2 HRC

**Execution:**

Shaft and punch shape fine ground.

Other lengths on request.



d <sub>2</sub>	d <sub>5</sub>	W <sub>min.</sub>	G <sub>max.</sub>	l <sub>1</sub>	l						
					63	71	80	90	100	110	125
10	10	1,6	9,9	13* 19*	●	●	●	●	●	●	●
13	12	4,5	12,9	13 19	●	●	●	●	●	●	●
16	12	6,0	15,9	13 19 25	●	●	●	●	●	●	●
20	12	8,0	19,9	13 19 25	●	●	●	●	●	●	●
25	12	10,0	24,9	13 19 25	●	●	●	●	●	●	●
32	12	12,5	31,9	13 19 25	●	●	●	●	●	●	●
40	12	14,0	39,9	19 25 30	●	●	●	●	●	●	●

\* l<sub>1</sub> = 10 where P or W < 2,20

**Ordering example:**

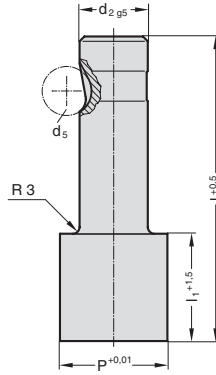
see fold out page E 29.

# Ball-lock punches, punch larger than shaft, heavy duty

2205.  
2215.



2205./2215.



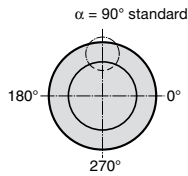
**Material:**

HSS  
hardened: 62 ± 2 HRC

**Execution:**

Shaft and punch diameter fine ground.

Other lengths on request.



## 2205.

d <sub>2</sub>	d <sub>5</sub>	P	l <sub>1</sub>	80	90	100
13	12	32,0	19 30	●	●	●
16	12	38,0	19 30	●	●	●
20	12	40,0	19 30	●	●	●
25	12	44,0	19 30	●	●	●
32	12	50,0	19 30	●	●	●
40	12	56,0	19 30	●	●	●

Ordering example:

see fold out page E 29.

## 2215.

d <sub>2</sub>	d <sub>5</sub>	P	l <sub>1</sub>	80	90	100
13	12	13,1 - 32,0	19 30	●	●	●
16	12	16,1 - 38,0	19 30	●	●	●
20	12	20,1 - 40,0	19 30	●	●	●
25	12	25,1 - 44,0	19 30	●	●	●
32	12	32,1 - 50,0	19 30	●	●	●
40	12	40,1 - 56,0	19 30	●	●	●

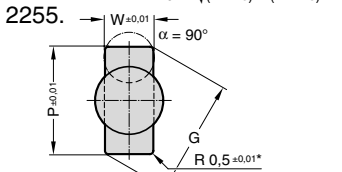
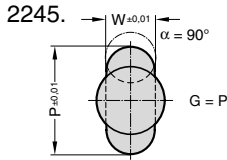
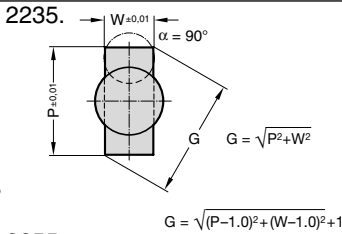
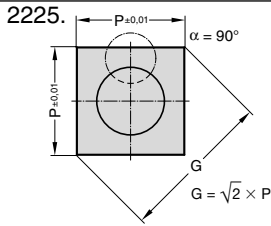
Ordering example:

see fold out page E 29.



2225. 2235.  
2245. 2255.

# Ball-lock punches, punch larger than shaft, heavy duty



\* For other radius options, see standardised special shapes, pages E 82 – E 83.



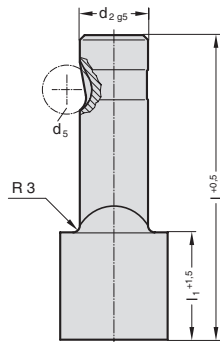
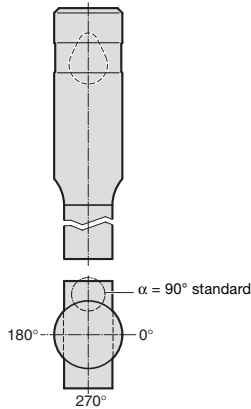
## Material:

HSS  
hardened: 62 ± 2 HRC

## Execution:

Shaft and punch shape fine ground.

Other lengths on request.



$d_2$	$d_5$	$W_{min}$	$G_{max}$	$l_1$	$l$		
					80	90	100
13	12	5,0	32,0	19 30	●	●	●
16	12	6,5	38,0	19 30	●	●	●
20	12	8,0	40,0	19 30	●	●	●
25	12	10,0	44,0	19 30	●	●	●
32	12	11,5	50,0	19 30	●	●	●
40	12	14,0	56,0	19 30	●	●	●

## Ordering example:

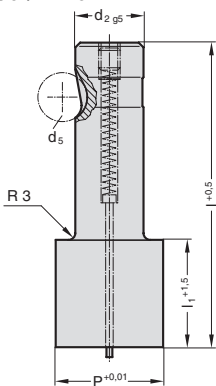
see fold out page E 29.

Ball-lock punches,  
punch larger than shaft,  
heavy duty with ejector pin

2705.  
2715.



2705./2715.



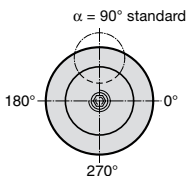
Material:

HSS  
hardened: 62 ± 2 HRC

Execution:

Shaft and punch diameter fine ground.

Other lengths on request.



2705.

d <sub>2</sub>	d <sub>5</sub>	P	l <sub>1</sub>	80	90	100
13	12	32,0	19 30	●	●	●
16	12	38,0	19 30	●	●	●
20	12	40,0	19 30	●	●	●
25	12	44,0	19 30	●	●	●
32	12	50,0	19 30	●	●	●
40	12	56,0	19 30	●	●	●

Ordering example:

see fold out page E 29.

2715.

d <sub>2</sub>	d <sub>5</sub>	P	l <sub>1</sub>	80	90	100
13	12	13,1 – 32,0	19 30	●	●	●
16	12	16,1 – 38,0	19 30	●	●	●
20	12	20,1 – 40,0	19 30	●	●	●
25	12	25,1 – 44,0	19 30	●	●	●
32	12	32,1 – 50,0	19 30	●	●	●
40	12	40,1 – 56,0	19 30	●	●	●

Ordering example:

see fold out page E 29.

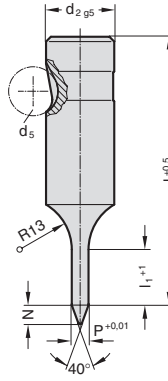


Ball-lock pilot pins,  
with tapered tip, heavy duty

2263.



2263.



Material:

HSS  
hardened: 62 ± 2 HRC

Execution:

Shaft and pilot pin fine ground.

Other lengths on request.

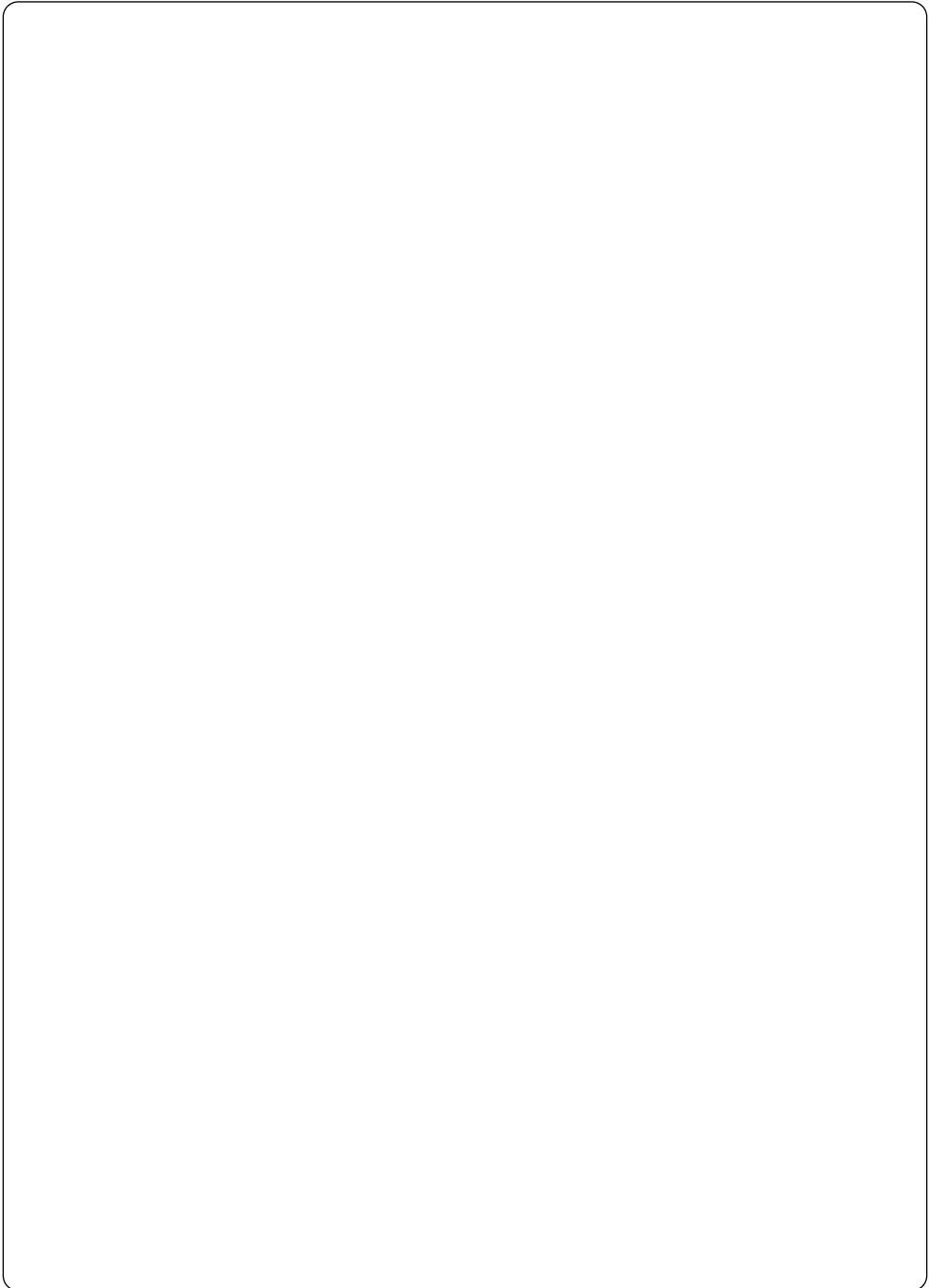
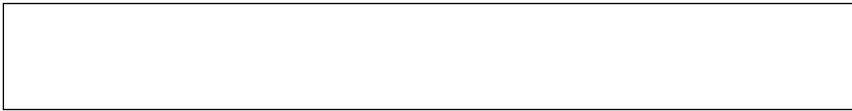
2263.

d <sub>2</sub>	d <sub>5</sub>	P <sub>min.</sub>	l <sub>1</sub>	N	71	80	90	100	110	125	140	150
10	10	5,9 - 9,9	19	8	●	●	●	●	●			
13	12	9,9 - 12,9	19	10	●	●	●	●	●	●	●	
16	12	12,9 - 15,9	25	15	●	●	●	●	●	●	●	
20	12	15,9 - 19,9	25	20	●	●	●	●	●	●	●	●
25	12	19,9 - 24,9	25	25	●	●	●	●	●	●	●	●
32	12	24,9 - 31,9	25	30	●	●	●	●	●	●	●	●
40	12	31,9 - 39,9	30	40	●	●	●	●	●	●	●	●

Ordering example:

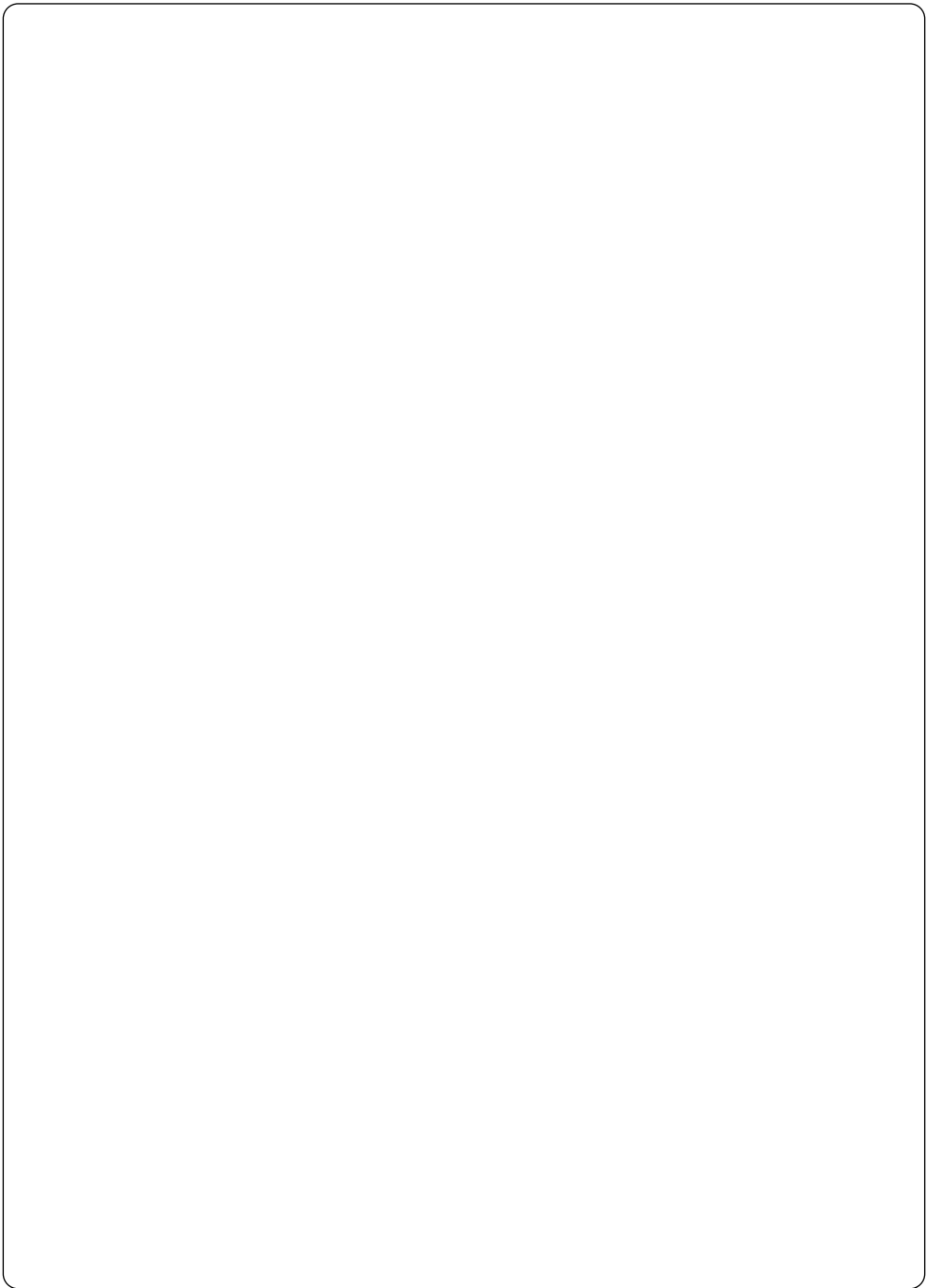
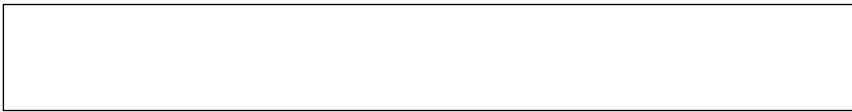
see fold out page E 29.







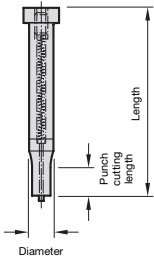
# Precision Punches ISO



# Ordering example Precision punches ISO 8020



**NB:** See table for standard dimensions  
Special dimensions to order



Punch:  
22 without ejector pin  
27 with ejector pin

2 2 4 1 . 7 G 4 . 0 6 5 0 . 0 4 5 0 A

Punch cutting length: $l_1$	Order No
8	= 1
10	= 2
13	= 3
19	= 4
25	= 5
30	= 6
special	= X

Format: Slot  
length P = 6,5 mm

Format:  
Slot  
width  
W = 4,5 mm

Version:	Order No
○ blank	= 0
⊙ round	= 1
□ square	= 2
▭ rectangular	= 3
⊔ slot	= 4
⊔ rectangle with radiused corners	= 5
▽ pilot pin with tapered tip	= 6
▽ pilot pin parabolic tip	= 7
special shapes	= 9

Diameter: $d_1$	Order No
3	= 1
4	= 2
5	= 3
6	= 4
8	= 5
10	= 6
13	= 7
16	= 8
20	= 9
25	= 10
32	= 11

Length: l	Order Code character
50	= A
56	= B
63	= C
71	= D
80	= E
90	= F
100	= G
110	= H
120	= J
125	= K
140	= L
150	= M
200	= N
special	= X

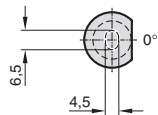
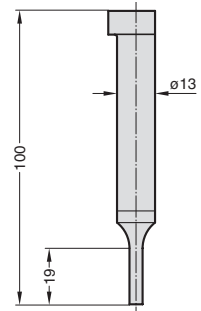
Angle:	Order Code character
0°	= A
90°	= B
180°	= C
270°	= D
special	= X

Type:	Order No
ISO	= 1

## Ordering Code (Example):

2 2 4 1 . 7 G 4 . 0 6 5 0 . 0 4 5 0 A

- Angle = 0° (A)
- Format: Slot, width W = 4,5 mm (0450)
- Format: Slot, length P = 6,5 mm (0650)
- Punch length:  $l_1$  = 19 mm (4)
- Length: l = 100 mm (G)
- Diameter:  $d_1$  = 13 mm (7)
- Type = ISO (1)
- Version: Slot (4)
- Punch: without ejector pin (22)

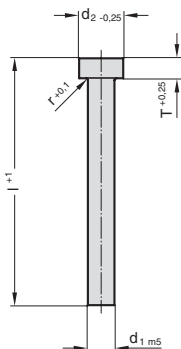


Precision Punches, ISO 8020  
Precision Punches, stepped, ISO 8020

2201.  
2211.



2201.



Material:

HSS  
Hardness: shaft 64±2 HRC  
              head 52±5 HRC  
ASP 23 – ASP 2023  
Hardness: shaft 64±2 HRC  
              head 52±5 HRC

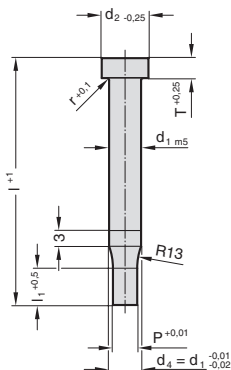
Ordering example: 2201.6D.ASP  
Diameter  $d_1=10$  \_\_\_\_\_  
Length =71 \_\_\_\_\_  
(see fold out pages)

Execution:

Head hot upset-forged, shank and shoulder fine ground.



2211.



Material:

HSS  
Hardness: shaft 64±2 HRC  
              head 52±5 HRC  
ASP 23 – ASP 2023  
upon request

Execution:

Head hot upset-forged, shank, shoulder and cutting diameter fine ground.

2201.

$d_1$	$d_2$	r	T	71	80	90	100	120	150	200
3	5	0,25	3	●	●	●	●	●		
4	6		3	●	●	●	●	●		
5	8	0,3	5	●	●	●	●	●		
6	9		5	●	●	●	●	●		
8	11		5	●	●	●	●	●		
10	13		5	●	●	●	●	●		
13	16	0,4	5	●	●	●	●	●	●	
16	19		5	●	●	●	●	●	●	●
20	23		5	●	●	●	●	●	●	●
25	28		5	●	●	●	●	●	●	●
32	35		5	●	●	●	●	●	●	●

Ordering example:

see fold out page E 53.

2211.

$d_1$	$d_2$	P	$l_1$	r	T	71	80	90	100	120
3	5	0,8–2,9	8	10	0,25	3	●	●	●	●
4	6	1,0–3,9	8	13		3	●	●	●	●
5	8	1,5–4,9	13	19	0,3	5	●	●	●	●
6	9	1,6–5,9	13	19		5	●	●	●	●
8	11	2,5–7,9	19	25		5	●	●	●	●
10	13	4,0–9,9	19	25		5	●	●	●	●
13	16	5,0–12,9	19	25	0,4	5	●	●	●	●
16	19	8,0–15,9	19	25		5	●	●	●	●
20	23	12,0–19,9	19	25		5	●	●	●	●
25	28	16,5–24,9	19	25		5	●	●	●	●
32	35	20,0–31,9	25	30		5	●	●	●	●

Ordering example:

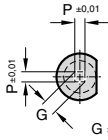
see fold out page E 53.



2221. 2231.  
2241. 2251.

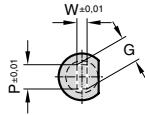
Precision Punches,  
stepped, ISO 8020

2221.



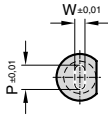
$$G = \sqrt{2} \times P$$

2231.



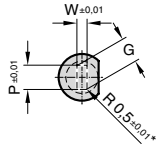
$$G = \sqrt{P^2 + W^2}$$

2241.



$$G = P$$

2251.



$$G = \sqrt{(P-1.0)^2 + (W-1.0)^2} + 1$$

\* For other radius options, see standardised special shapes, pages E 82 – E 83.



**Material:**

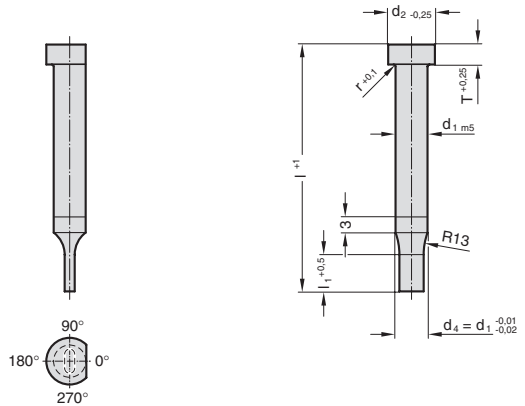
HSS  
Hardness: shaft 64±2 HRC  
head 52±5 HRC

**Execution:**

Punch head, hot swaged, seating, shaft and punch shape fine ground.

The anti-rotation surface parallel to P = 0° as standard.

ASP 23 – ASP 2023 upon request



d <sub>1</sub>	d <sub>2</sub>	W <sub>min</sub>	G <sub>max</sub>	l <sub>1</sub>	r	T	71	80	90	100	120
3	5	0,5–	2,9	8 10	0,25	3	●	●	●	●	●
4	6	0,8–	3,9	8 13		3	●	●	●	●	●
5	8	1,0–	4,9	13 19	0,3	5	●	●	●	●	●
6	9	1,6–	5,9	13 19		5	●	●	●	●	●
8	11	2,0–	7,9	19 25		5	●	●	●	●	●
10	13	3,5–	9,9	19 25		5	●	●	●	●	●
13	16	4,5–	12,9	19 25	0,4	5	●	●	●	●	●
16	19	6,0–	15,9	19 25		5	●	●	●	●	●
20	23	8,0–	19,9	19 25		5	●	●	●	●	●
25	28	10,0–	24,9	19 25		5	●	●	●	●	●
32	35	10,0–	31,9	25 30		5	●	●	●	●	●

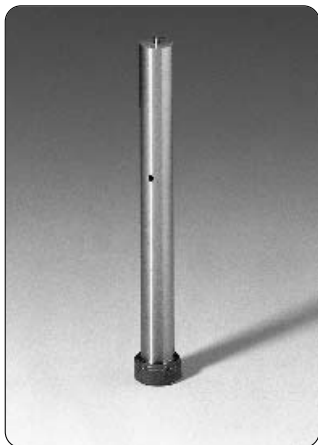
**Ordering example:**

see fold out page E 53.

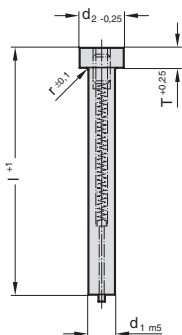
Precision Punches with Ejector Pin, ISO 8020  
 Precision Punches stepped,  
 with Ejector Pin ISO 8020

(replaces 2671.) 2701.

(replaces 2681.) 2711.



2701.



**Material:**

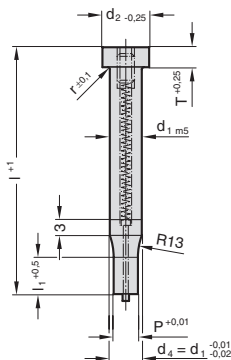
HSS  
 Hardness: shaft 64±2 HRC  
 head 52±5 HRC

**Execution:**

Head hot upset-forged, shank and shoulder fine ground.



2711.



**Material:**

HSS  
 Hardness: shaft 64±2 HRC  
 head 52±5 HRC

**Execution:**

Head hot upset-forged, shank, shoulder and cutting diameter fine ground.

2701.

d <sub>1</sub>	d <sub>2</sub>	r	T	71	80	90	100	120
5	8	0,3	5	●	●	●	●	●
6	9		5	●	●	●	●	●
8	11		5	●	●	●	●	●
10	13		5	●	●	●	●	●
13	16	0,4	5	●	●	●	●	●
16	19		5	●	●	●	●	●
20	23		5	●	●	●	●	●
25	28		5	●	●	●	●	●
32	35		5	●	●	●	●	●

Ordering example:

see fold out page E 53.

2711.

d <sub>1</sub>	d <sub>2</sub>	P	l <sub>1</sub>	r	T	71	80	90	100	120
5	8	1,6- 4,9	13 19	0,3	5	●	●	●	●	●
6	9	2,5- 5,9	13 19		5	●	●	●	●	●
8	11	2,5- 7,9	19 25		5	●	●	●	●	●
10	13	4,0- 9,9	19 25		5	●	●	●	●	●
13	16	5,0-12,9	19 25	0,4	5	●	●	●	●	●
16	19	8,0-15,9	19 25		5	●	●	●	●	●
20	23	12,0-19,9	19 25		5	●	●	●	●	●
25	28	16,5-24,9	19 25		5	●	●	●	●	●
32	35	20,0-31,9	25 30		5	●	●	●	●	●

Ordering example:

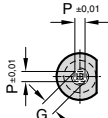
see fold out page E 53.



2721. 2731.  
2741. 2751.  
Replaces 2681.

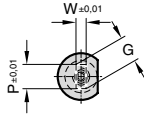
Precision Punches, stepped,  
with Ejector Pin ISO 8020

2721.



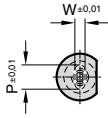
$$G = \sqrt{2} \times P$$

2731.



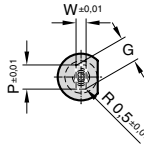
$$G = \sqrt{P^2 + W^2}$$

2741.



$$G = P$$

2751.



$$G = \sqrt{(P-1.0)^2 + (W-1.0)^2} + 1$$

\* For other radius options, see standardised special shapes, pages E 82 – E 83.



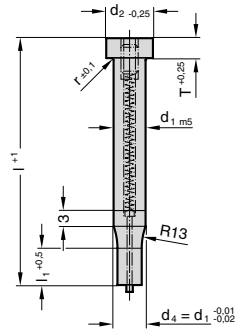
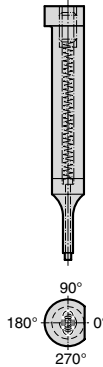
**Material:**

HSS  
Hardness: shaft 64±2 HRC  
head 52±5 HRC

**Execution:**

Punch head, hot swaged, seating, shaft and punch shape fine ground.

The anti-rotation surface parallel to  $P = 0^\circ$  as standard.



d <sub>1</sub>	d <sub>2</sub>	W <sub>min</sub> G <sub>max.</sub>	l <sub>1</sub>	r	T	71	80	90	100	120
5	8	1,6– 4,9	13	19	0,3	●	●	●	●	●
6	9	2,5– 5,9	13	19	5	●	●	●	●	●
8	11	2,5– 7,9	19	25	5	●	●	●	●	●
10	13	4,0– 9,9	19	25	5	●	●	●	●	●
13	16	5,0–12,9	19	25	0,4	5	●	●	●	●
16	19	8,0–15,9	19	25	5	●	●	●	●	●
20	23	12,0–19,9	19	25	5	●	●	●	●	●
25	28	16,5–24,9	19	25	5	●	●	●	●	●
32	35	20,0–31,9	25	30	5	●	●	●	●	●

**Ordering example:**

see fold out page E 53.

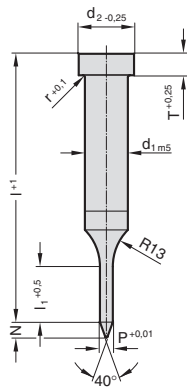
2 17956-2006 1 6

Pilot pins with tapered tip,  
ISO 8020

2261.



2261.



Material:

HSS  
Hardness: shaft 64±2 HRC  
head 52±5 HRC

Execution:

Punch head hot swaged, seating, shaft and pilot fine ground.

2261.

d <sub>1</sub>	d <sub>2</sub>	T	P	l <sub>1</sub>	N	63	71	80	90	100	110	125	140
5	8	5	1,0- 4,9	13	4	●	●						
6	9	5	1,6- 5,9	13	5	●	●	●					
8	11	5	2,5- 7,9	13	6	●	●	●	●				
10	13	5	4,0- 9,9	13 19	8	●	●	●	●	●			
13	16	5	5,0-12,9	13 19	10	●	●	●	●	●	●		
16	19	5	8,0-15,9	13 19 25	15	●	●	●	●	●	●	●	
20	23	5	12,0-19,9	13 19 25	20	●	●	●	●	●	●	●	●
25	28	5	16,5-24,9	13 19 25	25	●	●	●	●	●	●	●	●
32	35	5	20,0-31,9	19 25	30		●	●	●	●	●	●	●

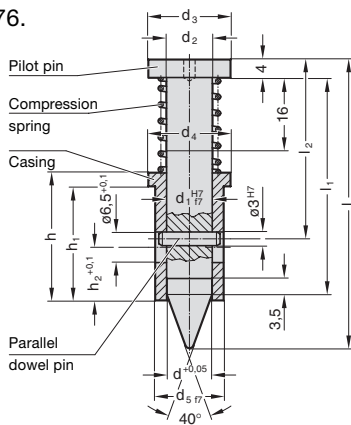
Ordering example:

see fold out page E 53.





2276.



**Description:**

The pilot unit provides exact positioning of sheet metal parts. There are 2 sizes.

The pilot unit 10 can be used for a hole diameter of 5 – 10 mm and is available as a finished item, 9.8 mm diameter. Smaller diameters have to be ground by the Tool Making department.

The pilot unit 16 is used for diameters 10-16 mm and is available as a blank, 16 mm diameter.

**Material:**

The pilot unit consists of:  
Pilot pin, Casing, Compression spring, Parallel dowel pin

**2276.**

Order No	d	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>4</sub>	d <sub>5</sub>	h	h <sub>1</sub>	h <sub>2</sub>	l <sub>1</sub>	l <sub>2</sub>	l	Spring force in daN	
													preloaded	compressed
2276.1.	9,8	10	10	18	18	15	28	25	12	47,5	39,3	63,2	4,9	6,2
2.	16	16	16	24	30	26	28	25	12	54,5	46,3	72,5	4,8	5,6

**Ordering example:**

2 2 7 6 . 1 . A . 0 9 8 0

