Ground Precision Components

CESEHSA soluciones

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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.

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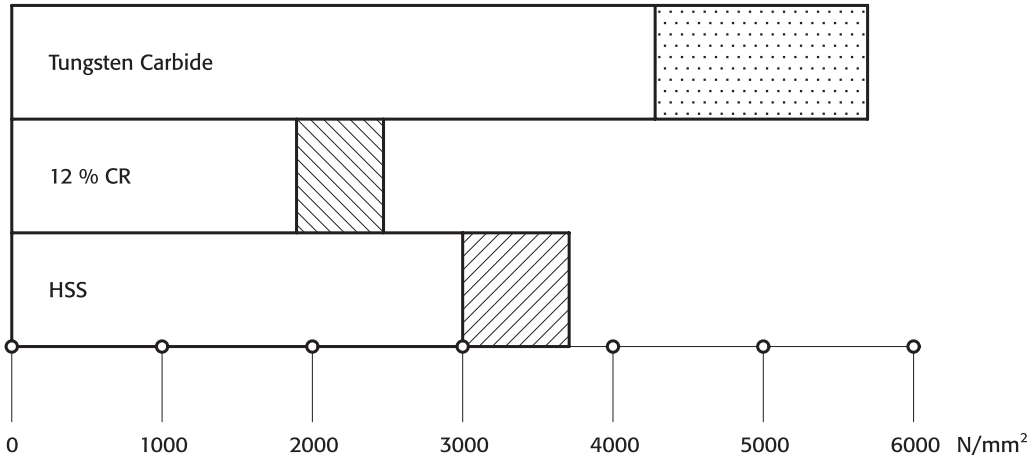
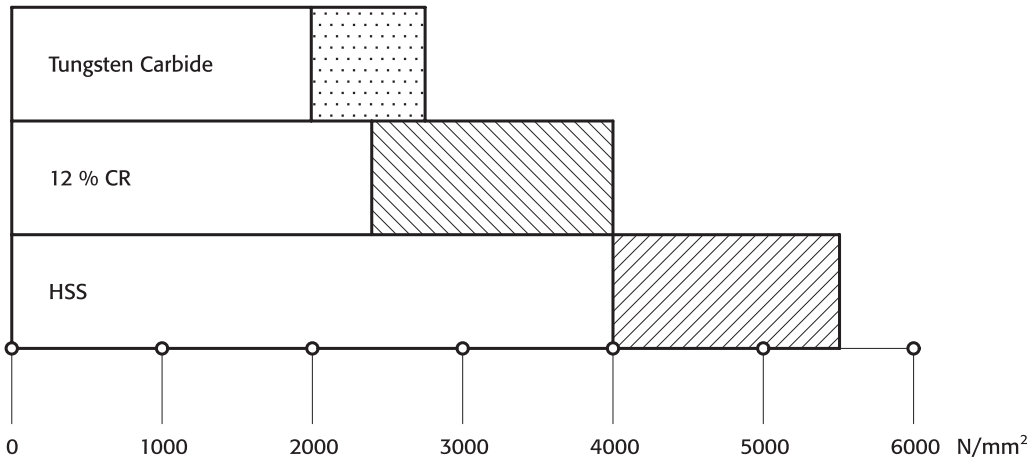
Comparative Graphs

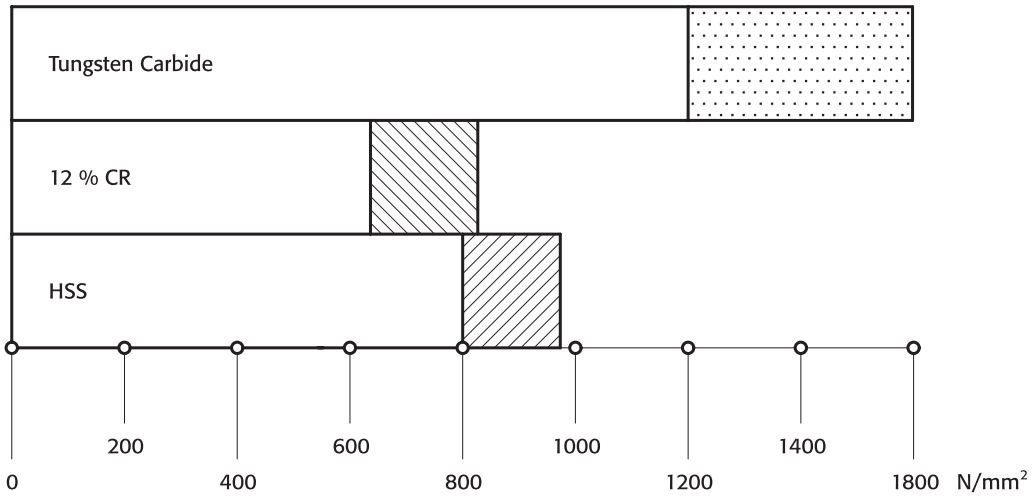
Compressive strength (0,2 proof stress)



Flexural strength



Hardness Vickers



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
ASP 2023 = High Speed Steel on Powder-Metallurgic Basis

Characteristics: High wear resistance – greater toughness due to excellent homogenity.

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**. ...

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 distorsion problems, TIC-TIN is not recommanded 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.

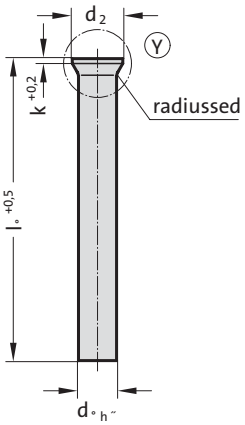
Characteristics: Chrome-Molybdenum-Vanadium hot working die steel; core strength: > 1400 N/mm²; temperature resistant up to 650°C; surface hardness (nitrided) ≧ 950 HV 0,3.

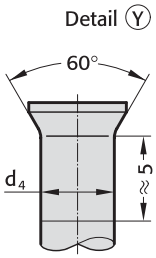
Application Field: Ejector pins for pressure diecasting, injection- and compression moulding processes, and generally for work at elevated temperatures.

NWA = **material code number = "8"**
e. g. Order No = 237. **8**. ...

Punch DIN 9861 Shape DA

222.





222. Punch DIN 9861 Shape DA

	Gradation						
d_1	d_1	d_2	k	l_1	71	80	100
0.5	0.05	0.9	0.2		●	●	●
0.55	0.05	1	0.2		●	●	●
0.6	0.05	1.1	0.2		●	●	●
0.65	0.05	1.2	0.2		●	●	●
0.7 - 0.75	0.05	1.3	0.2		●	●	●
0.8 - 0.85	0.05	1.4	0.4		●	●	●
0.9 - 0.95	0.05	1.6	0.4		●	●	●
1 - 1.1	0.1	1.8	0.5		●	●	●
1.2 - 1.3	0.1	2	0.5		●	●	●
1.4 - 1.5	0.1	2.2	0.5		●	●	●
1.6 - 1.7	0.1	2.5	0.5		●	●	●
1.8 - 1.9	0.1	2.8	0.5		●	●	●
2	0.1	3	0.5		●	●	●
2.1 - 2.2	0.1	3.2	0.5		●	●	●
2.3 - 2.5	0.1	3.5	0.5		●	●	●
2.6 - 2.9	0.1	4	0.5		●	●	●
3 - 3.4	0.1	4.5	0.5		●	●	●
3.5 - 3.9	0.1	5	0.5		●	●	●
4 - 4.4	0.1	5.5	0.5		●	●	●
4.5 - 4.9	0.1	6	0.5		●	●	●
5 - 5.4	0.1	6.5	0.5		●	●	●
5.5 - 5.9	0.1	7	0.5		●	●	●
6 - 6.4	0.1	8	0.5		●	●	●
6.5 - 7	0.5	9	1		●	●	●
7.5 - 8	0.5	10	1		●	●	●
8.5 - 9	0.5	11	1		●	●	●
9.5 - 10	0.5	12	1		●	●	●
10.5 - 11	0.5	13	1		●	●	●
11.5 - 12	0.5	14	1		●	●	●
12.5 - 13	0.5	15	1		●	●	●
13.5 - 14	0.5	16	1.5		●	●	●
14.5 - 15	0.5	17	1.5		●	●	●
15.5 - 16	0.5	18	1.5		●	●	●

Material:

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

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

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

Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

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

d_4: For d_1 < 1 mm $d_4 = d_1 + 0{,}02$
For d_1 ≥ 1 mm $d_4 = d_1 + 0{,}03$

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

Note:

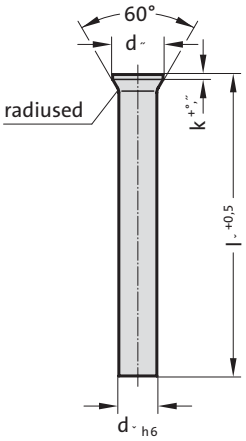
Punches are also available without head

Ordering Code (example):

Punch DIN 9861 Shape DA		=	222.		
Material MAT	HSS	=	3.		
Shaft diameter d_1	0.5 mm	=	0050.		
Length l_1	71 mm	=		071	
Order No		=	222.	3. 0050.	071

Punch DIN 9861 Shape D / ISO 6752

223.



Material:

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

Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

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

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

223. Punch DIN 9861 Shape D / ISO 6752

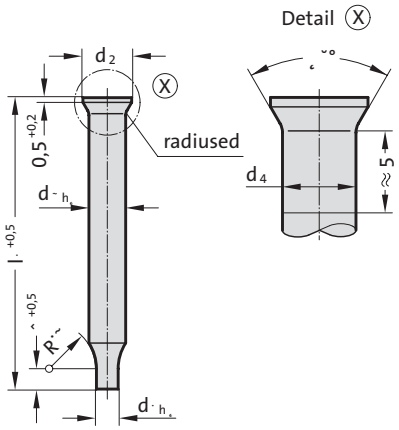
	Gradation						
d_1	d_1	d_2	k	l_1	71	80	100
0.5	0.05	0.9	0.2		●	●	●
0.55	0.05	1	0.2		●	●	●
0.6	0.05	1.1	0.2		●	●	●
0.65	0.05	1.2	0.2		●	●	●
0.7 - 0.75	0.05	1.3	0.2		●	●	●
0.8 - 0.85	0.05	1.4	0.4		●	●	●
0.9 - 0.95	0.05	1.6	0.4		●	●	●
1 - 1.1	0.1	1.8	0.5		●	●	●
1.2 - 1.3	0.1	2	0.5		●	●	●
1.4 - 1.5	0.1	2.2	0.5		●	●	●
1.6 - 1.7	0.1	2.5	0.5		●	●	●
1.8 - 1.9	0.1	2.8	0.5		●	●	●
2	0.1	3	0.5		●	●	●
2.1 - 2.2	0.1	3.2	0.5		●	●	●
2.3 - 2.5	0.1	3.5	0.5		●	●	●
2.6 - 2.9	0.1	4	0.5		●	●	●
3 - 3.4	0.1	4.5	0.5		●	●	●
3.5 - 3.9	0.1	5	0.5		●	●	●
4 - 4.4	0.1	5.5	0.5		●	●	●
4.5 - 4.9	0.1	6	0.5		●	●	●
5 - 5.4	0.1	6.5	0.5		●	●	●
5.5 - 5.9	0.1	7	0.5		●	●	●
6 - 6.4	0.1	8	0.5		●	●	●
6.5 - 7	0.5	9	1		●	●	●
7.5 - 8	0.5	10	1		●	●	●
8.5 - 9	0.5	11	1		●	●	●
9.5 - 10	0.5	12	1		●	●	●
10.5 - 11	0.5	13	1		●	●	●
11.5 - 12	0.5	14	1		●	●	●
12.5 - 13	0.5	15	1		●	●	●
13.5 - 14	0.5	16	1.5		●	●	●
14.5 - 15	0.5	17	1.5		●	●	●
15.5 - 16	0.5	18	1.5		●	●	●
16.5 - 17	0.5	19	1.5		●	●	●
17.5 - 18	0.5	20	1.5		●	●	●
18.5 - 19	0.5	21	1.5		●	●	●
19.5 - 20	0.5	22	1.5		●	●	●

Ordering Code (example):

Punch DIN 9861 Shape D / ISO 6752		=	223.
Material MAT	HSS	=	3.
Shaft diameter d_1	0.5 mm	=	0050.
Length l_1	71 mm	=	071
Order No		=	223. 3. 0050. 071

Punch DIN 9861 Shape CA

224.



224. Punch DIN 9861 Shape CA

	Gradation				
d_1	d_1	d_2	d_3	d_4	l_1
0.1 - 1.5	0.05	3	2	2.03	71
1.55 - 2.95	0.05	4.5	3	3.03	71

Material:

HSS
Order No 224.3.
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 3 HRC

HZ - TIN (HSS)
Order No 224.0.
Hardnes:
Surface 2300 HV 0,05
Head 52 ± 3 HRC

Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

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

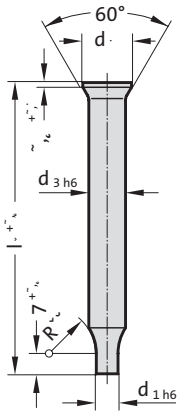
Stock lenghts: 71 mm.
Other lengths and diameters on request!

Ordering Code (example):

Punch DIN 9861 Shape CA		=	224.
Material MAT	HSS	=	3.
Cutting diameter d_1	0.1 mm	=	0010.
Length l_1	71 mm	=	071
Order No		=	224. 3. 0010. 071

Punch DIN 9861 Shape C

225.



Material:

HSS
Order No 225.3.
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 3 HRC

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

HZ - TIN (HSS)
Order No 225.0.
Hardness:
Surface 2300 HV 0,05
Head 52 ± 3 HRC

ASP 23 - ASP 2023
Order No 225.6.
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 3 HRC

Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

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

Stock lenghts: 71 mm.
Other lengths and diameters on request!

225. Punch DIN 9861 Shape C

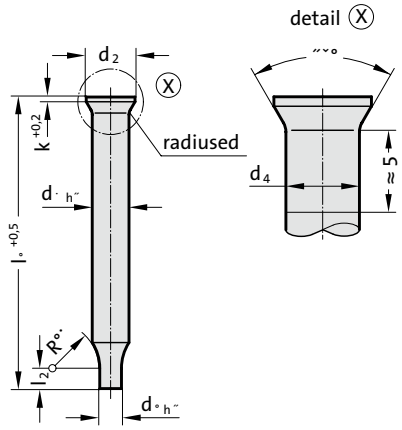
	Gradation			
d_1	d_1	d_2	d_3	l_1
0.1 - 1.5	0.05	3	2	71
1.55 - 2.95	0.05	4.5	3	71

Ordering Code (example):

Punch DIN 9861 Shape C		=	225.		
Material MAT	HSS	=	3.		
Cutting diameter d_1	0.1 mm	=		0010.	
Length l_1	71 mm	=			071
Order No		=	225.	3. 0010.	071

Punch similar to DIN 9861 Shape CA

274.



274. Punch similar to DIN 9861 Shape CA

	Gradation									
d_1	d_1	d_2	d_3	d_4	l_2	k	l_1	71	80	100
1 - 3.9	0.05	5.5	4	4.03	5 - 20	0.5		●	●	●
1.5 - 4.9	0.05	6.5	5	5.03	5 - 20	0.5		●	●	●
1.6 - 5.9	0.05	8	6	6.03	5 - 20	0.5		●	●	●
2.5 - 7.9	0.05	10	8	8.03	5 - 20	1		●	●	●
4 - 9.9	0.05	12	10	10.03	5 - 20	1		●	●	●
5 - 12.9	0.05	15	13	13.03	5 - 20	1		●	●	●
8 - 15.9	0.05	18	16	16.03	5 - 20	1.5		●	●	●

Description:

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 whichare ground from stock sizes of the 222.-series.
Please select from those ranges and complete your order in accordance with the example on the right.

Material:

HSS
Order No 274.3.
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 3 HRC

HST
Order No 274.4.
Hardness:
Surface ≥ 950 HV 0,3
Head 52 ± 3 HRC

HZ - TIN (HSS)
Order No 274.0.
Hardness:
Surface 2300 HV 0,05
Head 52 ± 3 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

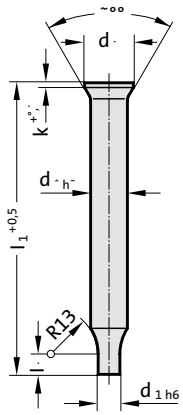
Shaft precision ground. Head subsequently hot upset-forged and tempered; residual upset-buge below head normally much smaller than permissible acc. to DIN 9861.
Stock lenghts: 71, 80, 100 mm.
other lengths and diameters on request!

Ordering Code (example):

Punch similar to DIN 9861 Shape CA		=	274.
Material MAT	HSS	=	3.
Shaft diameter d_3	8 mm	=	0800.
Length l_1	71 mm	=	071.
Cutting diameter d_1	2.5 mm	=	0250.
Punch cutting length l_2	5 mm	=	05
Order No		=	274. 3. 0800. 071. 0250. 05

Punch similar to DIN 9861 Shape C

275.



Description:

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 whichare ground from stock sizes of the 223.-series
Please select from those ranges and complete your order in accordance with the example on the right.

Material:

HSS
Order No 275.3.
Hardness: Shaft 64 ± 2 HRC; Head 52 ± 3 HRC

HST
Order No 275.4.
Hardness: Surface ≥ 950 HV 0,3; Head 52 ± 3 HRC

HZ - TIN (HSS)
Order No 275.0.
Hardness: Surface 2300 HV 0,05; Head 52 ± 3 HRC

ASP 23 - ASP 2023
Order No 275.6.
Hardness: Shaft 64 ± 2 HRC; Head 52 ± 3 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

Head hot upset-forged and tempered. Shaft and head subsequently precision plunge-ground for perfect concentricity and full interchangeability with replacement punches.
Stock lenghts: 71, 80, 100 mm.
other lengths and diameters on request!

275. Punch similar to DIN 9861 Shape C

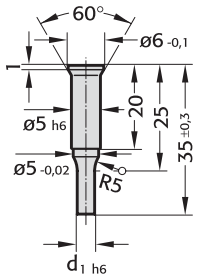
	Gradation								
d_1	d_1	d_2	d_3	l_2	k	l_1	71	80	100
1 - 3.9	0.05	5.5	4	5 - 20	0.5		●	●	●
1.5 - 4.9	0.05	6.5	5	5 - 20	0.5		●	●	●
1.6 - 5.9	0.05	8	6	5 - 20	0.5		●	●	●
2.5 - 7.9	0.05	10	8	5 - 20	1		●	●	●
4 - 9.9	0.05	12	10	5 - 20	1		●	●	●
5 - 12.9	0.05	15	13	5 - 20	1		●	●	●
8 - 15.9	0.05	18	16	5 - 20	1.5		●	●	●

Ordering Code (example):

Punch similar to DIN 9861 Shape C		=	275.					
Material MAT	HSS	=		3.				
Shaft diameter d_3	8 mm	=			0800.			
Length l_1	71 mm	=				071.		
Cutting diameter d_1	2.5 mm	=					0250.	
Punch cutting length l_2	5 mm	=						05
Order No		=	275.	3.	0800.	071.	0250.	05

Punch VDI 3374

232.



232. Punch VDI 3374

	Gradation
d_1	d_1
2 - 5	0.1

Material:

HSS
Order No 232.3.
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 3 HRC

Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

Punch head hot upset-forged.
Shaft and shoulder precision plunge-ground.

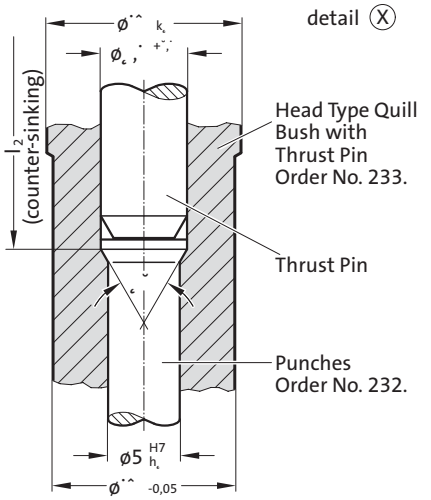
Note:

Matching insert sleeves 233. and 234.

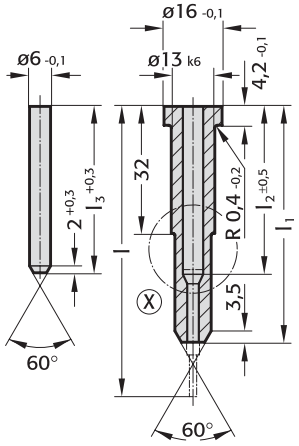
Ordering Code (example):

Punch VDI 3374		=	232.
Material MAT	HSS	=	3.
Cutting diameter d_1	2 mm	=	0200
Order No		=	232. 3. 0200

Insert sleeve with thrust pin VDI 3374 Shape A



233.



Material:

Insert sleeve:
Steel C 45 heat treated to 800 N/mm²
Thrust pin:
HWS, hardened 62 ± 2 HRC

Execution:

Insert sleeve: shaft precision ground
Thrust pin: ground

Note:

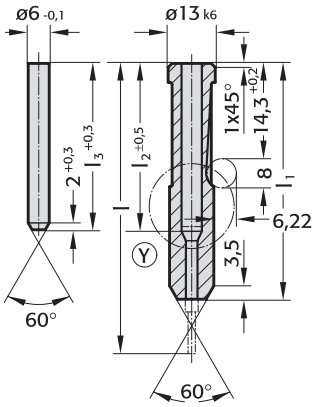
Matching punch 232.

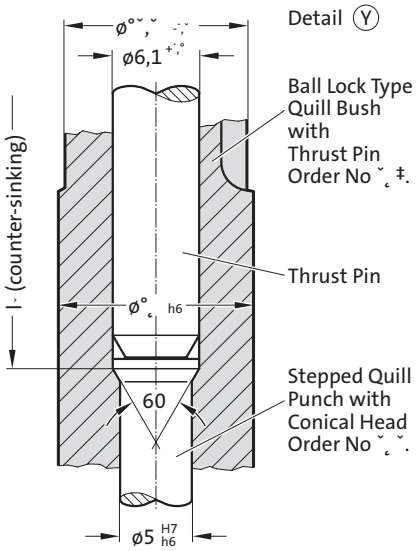
233. Insert sleeve with thrust pin VDI 3374 Shape A

Order No	l	l_1	l_2	l_3
233.7.048	63	48	29	29
233.7.057	71	57	37	37
233.7.065	80	65	46	46

Insert sleeve with thrust pin VDI 3374 Shape B

234.





234. Insert sleeve with thrust pin VDI 3374 Shape B

Order No	l	l_1	l_2	l_3
234.7.048	63	48	29	29
234.7.057	71	57	37	37
234.7.065	80	65	46	46

Material:

Insert sleeve:
Steel C 45 heat treated to 800 N/mm²
Thrust pin:
HWS, hardened 62 ± 2 HRC

Execution:

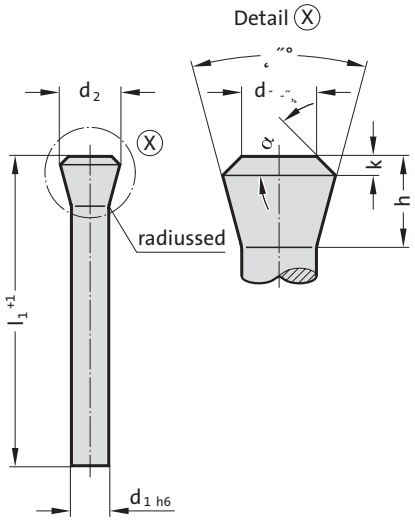
Insert sleeve: shaft precision ground
Thrust pin: ground

Note:

Matching punch 232.

Punch with tapered head 30°, Shape D

2281.



Material:

HSS
Order No 2281.3.
Hardness:
Shaft 58 + 2 HRC
Head ≤ 50 HRC

Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

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

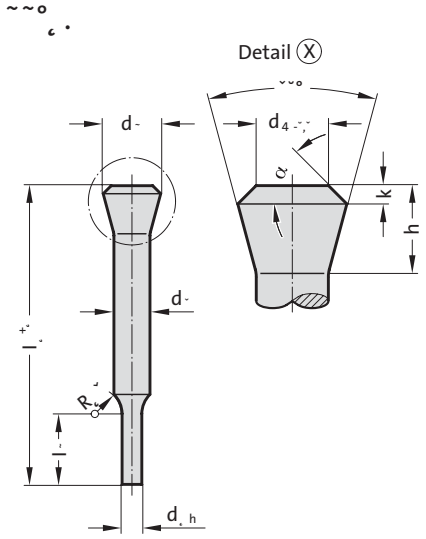
2281. Punch with tapered head 30°, Shape D

d_1	d_2	d_4	h	k	α ± 1°	l_1	l_1
						100	120
5.5	8.98	5.5	7.5	1	30	●	●
6	9.75	6	8	1	28	●	●
8	12.8	8	10	1	22.5	●	●
9	14.4	9	11	1	20	●	●
10	15.9	10	12	1	19	●	●
12	18.7	12	14	1.5	24		●
14	21.8	14	16	1.5	21		●
16	24.6	16	18	2	25		●

Ordering Code (example):

Punch with tapered head 30°, Shape D		=	2281.
Material MAT	HSS	=	3.
Shaft diameter d_1	5.5 mm	=	0550.
Length l_1	100 mm	=	100
Order No		=	2281. 3. 0550. 100

Punch with tapered head 30°, Shape C



2291. Punch with tapered head 30°, Shape C

d_3	d_2	d_4	h	k	α ±1°	l_1 100	l_1 120
5.5	8.98	5.5	7.5	1	30	●	●
6	9.75	6	8	1	28	●	●
8	12.8	8	10	1	22.5	●	●
9	14.4	9	11	1	20	●	●
10	15.9	10	12	1	19	●	●
12	18.7	12	14	1.5	24		●
14	21.8	14	16	1.5	21		●
16	24.6	16	18	2	25		●

Material:

HSS
Order No 2291.3.
Hardness:
Shaft 58 + 2 HRC
Head ≤ 50 HRC

Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

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

d_1 and l_2 to customer's specifications!

Ordering Code (example):

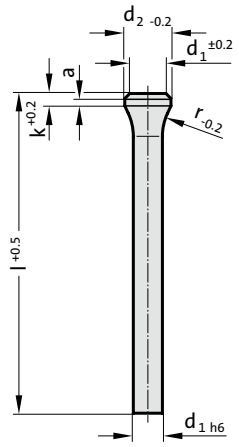
Punch with tapered head 30°, Shape C		=	2291.
Material MAT	HSS	=	3.
Shaft diameter d_3	5.5 mm	=	0550.
Length l_1	100 mm	=	100.
Cutting diameter d_1	2.75 mm	=	0275.
Punch cutting length l_2	5 mm	=	005
Order No		=	2291. 3. 0550. 100. 0275. 005

PUNCH WITH TAPERED HEAD, DIN 5118 SHAPE A

2284.3. Punch with tapered head, DIN 5118 Shape A

d_1	d_2	a	k	r	l	71	80	100	110
2	3	1	3	3.5		●	●	●	
2.1	3.2	1	3	5		●	●	●	
2.2	3.2	1	3	5		●	●	●	
2.3	3.5	1	3	5		●	●	●	
2.4	3.5	1	3	5		●	●	●	
2.5	3.5	1	3	5		●	●	●	
2.6	4	1	3	6.5		●	●	●	
2.7	4	1	3	6.5		●	●	●	
2.8	4	1	3	6.5		●	●	●	
2.9	4	1	3	6.5		●	●	●	
3.1	4.5	1	3	6.5		●	●	●	
3.2	4.5	1	3	6.5		●	●	●	
3.3	4.5	1	3	6.5		●	●	●	
3.4	4.5	1	3	6.5		●	●	●	
3.5	5	1	3	8		●	●	●	
3.6	5	1	3	8		●	●	●	
3.7	5	1	3	8		●	●	●	
3.8	5	1	3	8		●	●	●	
4.1	5.5	1.5	4	8		●	●	●	
4.2	5.5	1.5	4	8		●	●	●	
4.3	5.5	1.5	4	8		●	●	●	
4.4	5.5	1.5	4	8		●	●	●	
4.5	6	1.5	4	8		●	●	●	
4.6	6	1.5	4	8		●	●	●	
4.7	6	1.5	4	8		●	●	●	
4.8	6	1.5	4	8		●	●	●	
4.9	6	1.5	4	8		●	●	●	
5.1	7	1.5	4	10		●		●	
5.2	7	1.5	4	10			●	●	
5.5	8	1.5	4	10		●	●	●	
5.6	8	1.5	4	10				●	
6.1	9	1.5	4	10				●	
6.2	9	1.5	4	10				●	
6.3	9	1.5	4	10		●		●	
6.4	9	1.5	4	10		●		●	
6.5	10	1.5	4	12		●		●	●
7	10	1.5	4	12		●	●	●	
7.5	11	1.5	4	12		●	●	●	
7.7	11	1.5	4	12				●	
8.1	11	1.5	4	12		●		●	
8.5	13	1.5	4	15		●	●	●	
9	13	1.5	4	15		●	●	●	●
9.5	14	1.5	4	15		●		●	
10.5	15	1.5	4	15				●	
11	15	1.5	4	15				●	
11.5	16	1.5	4	15				●	
12	16	1.5	4	15				●	●
12.5	17	1.5	4	15				●	
13.5	18	1.5	4	15				●	
14	18	1.5	4	15				●	●
14.5	19	1.5	4	15				●	
15	19	1.5	4	15				●	●
15.5	20	1.5	4	15				●	
17	21	1.5	4	15		●		●	●
18	22	1.5	4	15				●	●
19	23	1.5	4	15				●	
19.5	25	1.5	4	15				●	

2284.3.



Material:
HSS
Order No 2284.3.
Hardness:
Shaft 62-66 HRC
Head 45-55 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Shaft precision ground. Head subsequently hot upset-forged and tempered.

Note:
Matching piloted counterbore 2284.00.

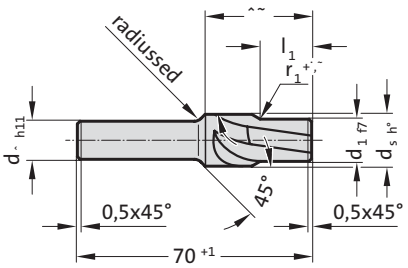
Ordering Code (example):

Punch with tapered head, DIN 5118			
Shape A		=	2284.3.
Shaft diameter d_1	5.2 mm	=	0520.
Length l	80 mm	=	080
Order No		=	2284.3. 0520. 080

Piloted counterbore for tapered-head punch

2284.00. Piloted counterbore for tapered-head punch

d_1	d_s	d_3	r_1	l_1
2	3.3	3.3	3.5	5
2.1	3.5	3.5	5	5
2.2	3.5	3.5	5	5
2.3	3.8	3.8	5	5
2.4	3.8	3.8	5	5
2.5	3.8	3.8	5	5
2.6	4.3	4.3	6.5	7
2.7	4.3	4.3	6.5	7
2.8	4.3	4.3	6.5	7
2.9	4.3	4.3	6.5	7
3	4.9	4.9	6.5	7
3.1	4.9	4.9	6.5	7
3.2	4.9	4.9	6.5	7
3.3	4.9	4.9	6.5	7
3.4	4.9	4.9	6.5	7
3.5	5.4	5.4	8	8
3.6	5.4	5.4	8	8
3.7	5.4	5.4	8	8
3.8	5.4	5.4	8	8
4	5.9	5.9	8	8
4.1	5.9	5.9	8	8
4.2	5.9	5.9	8	8
4.3	5.9	5.9	8	8
4.4	5.9	5.9	8	8
4.5	6.4	6.4	8	8
4.6	6.4	6.4	8	8
4.7	6.4	6.4	8	8
4.8	6.4	6.4	8	8
4.9	6.4	6.4	8	8
5	7.4	7.4	10	10
5.1	7.4	7.4	10	10
5.2	7.4	7.4	10	10
5.5	8.5	8.5	10	10
5.6	8.5	8.5	10	10
6	9.5	9.5	10	10
6.1	9.5	9.5	10	10
6.2	9.5	9.5	10	10
6.3	9.5	9.5	10	10
6.4	9.5	9.5	10	10
6.5	10.5	10.5	12	12
7	10.5	10.5	12	12
7.5	11.5	11.5	12	12
7.7	11.5	11.5	12	12
8	11.5	11.5	12	12
8.1	11.5	11.5	12	12
8.5	13.5	13	15	12
9	13.5	13	15	12
9.5	14.5	13	15	12
10	14.5	13	15	12
10.5	15.5	13	15	15
11	15.5	13	15	15
11.5	16.5	13	15	15
12	16.5	13	15	15
12.5	17.5	13	15	15
13	17.5	13	15	15
13.5	18.5	13	15	15
14	18.5	13	15	15
14.5	19.5	13	15	15
15	19.5	13	15	15
15.5	20.5	13	15	15
16	20.5	13	15	15
17	21.5	16	15	15
18	22.5	16	15	15
19	23.5	16	15	15
19.5	25.5	16	15	15
20	25.5	16	15	15



Material:
HSS, hardened 62-66 HRC

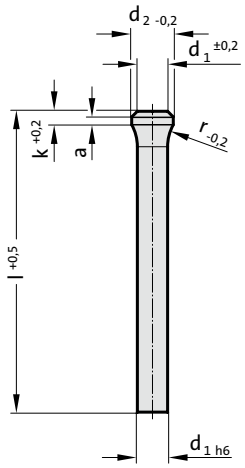
Execution:
Tempered and ground.

Ordering Code (example):

Piloted counterbore for tapered-head punch		=2284.00.
Shaft diameter d_1	2 mm =	0200
Order No		=2284.00. 0200

PUNCH WITH TAPERED HEAD, BLANK, DIN 5118 SHAPE A

2206.



2206. Punch with tapered head, blank, DIN 5118 Shape A

d_1 / Order No	d_2	a	k	r	l (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)	150 (M)	200 (N)
3/(1)	4.5	1	3	6.5		●	●	●	●	●		
4/(2)	5.5	1.5	4	8		●	●	●	●	●		
5/(3)	7	1.5	4	10		●	●	●	●	●		
6/(4)	9	1.5	4	10		●	●	●	●	●		
8/(5)	11	1.5	4	12		●	●	●	●	●		
10/(6)	14	1.5	4	15		●	●	●	●	●	●	
13/(7)	17	1.5	4	15		●	●	●	●	●	●	●
16/(8)	20	1.5	4	15		●	●	●	●	●	●	●
20/(9)	25	1.5	4	15		●	●	●	●	●	●	●

Material:
HSS
Hardness:
Shaft 62-66 HRC
Head 45-55 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Shaft precision ground. Head subsequently hot upset-forged and tempered.

Note:
Matching piloted counterbore 2284.00.
Matching retainer ring2284.00.01.

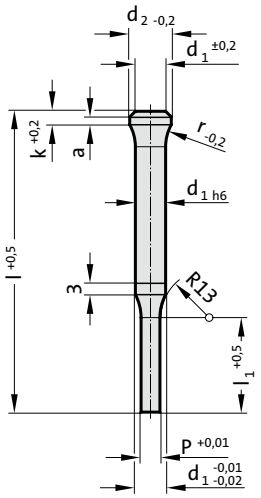
Ordering Code (example):

2206.7G

Length: l 100 mm		**Order Code character** = (G)
Diameter: d_1 13 mm		**Order No** = (7)
Type: with tapered hea		**Order No** = (6)
Execution: blank		**Order No** = (0)
Punch: without ejector pin		= 22

PUNCH WITH TAPERED HEAD, STEPPED, ROUND, DIN 5118 SHAPE B

2216.



2216. Punch with tapered head, stepped, round, DIN 5118 Shape B

d_1 / Order No	d_2	p	l_1 / Order No	a	k	r	l (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)	150 (M)	200 (N)
3 / (1)	4.5	0.8-2.9	8(1) 10(2)	1	3	6.5		●	●	●	●	●		
4 / (2)	5.5	1.0-3.9	8(1) 13(3)	1.5	4	8		●	●	●	●	●		
5 / (3)	7	1.5-4.9	13(3) 19(4)	1.5	4	10		●	●	●	●	●		
6 / (4)	9	1.6-5.9	13(3) 19(4)	1.5	4	10		●	●	●	●	●		
8 / (5)	11	2.5-7.9	19(4) 25(5)	1.5	4	12		●	●	●	●	●		
10 / (6)	14	4.0-9.9	19(4) 25(5)	1.5	4	15		●	●	●	●	●	●	
13 / (7)	17	5.0-12.9	19(4) 25(5)	1.5	4	15		●	●	●	●	●	●	●
16 / (8)	20	8.0-15.9	19(4) 25(5)	1.5	4	15		●	●	●	●	●	●	●
20 / (9)	25	12.0-19.9	19(4) 25(5)	1.5	4	15		●	●	●	●	●	●	●

Ordering Code (example):

2216.7G4.0720

Shape: round	
P = ø7,2 mm	= 0720
Punch cutting length: l_1	**Order No**
19 mm	= (4)
Length: l	**Order Code character**
100 mm	= (G)
Diameter: d_1	**Order No**
13 mm	= (7)
Type:	**Order No**
with tapered hea	= (6)
Execution:	**Order No**
round	= (1)
Punch:	
without ejector pin	= 22

Material:
HSS
Hardness:
Shaft 62-66 HRC
Head 45-55 HRC

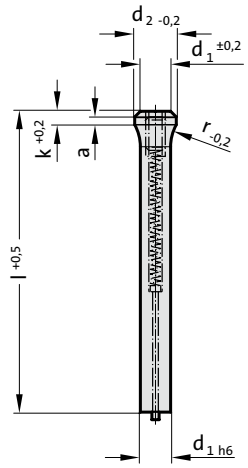
☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Shaft precision ground. Head subsequently hot upset-forged and tempered.

Note:
Matching piloted counterbore 2284.00.
Matching retainer ring2284.00.01.

PUNCH WITH TAPERED HEAD, BLANK, WITH EJECTOR PIN, DIN 5118 SHAPE E

2706.



2706. Punch with tapered head, blank, with ejector pin, DIN 5118 Shape E

d_1 / Order No	d_2	a	k	r	l (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)
5 / (3)	7	1.5	4	10		●	●	●	●	●
6 / (4)	9	1.5	4	10		●	●	●	●	●
8 / (5)	11	1.5	4	12		●	●	●	●	●
10 / (6)	14	1.5	4	15		●	●	●	●	●
13 / (7)	17	1.5	4	15		●	●	●	●	●
16 / (8)	20	1.5	4	15		●	●	●	●	●
20 / (9)	25	1.5	4	15		●	●	●	●	●

Material:
HSS
Hardness:
Shaft 62-66 HRC
Head 45-55 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Shaft precision ground. Head subsequently hot upset-forged and tempered.

Note:
Matching piloted counterbore 2284.00.
Matching retainer ring2284.00.01.

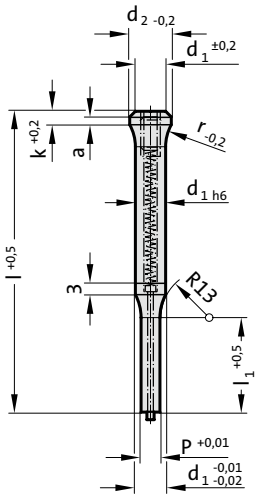
Ordering Code (example):

2706.7G

Length: l	100 mm	**Order Code character** = (G)
Diameter: d_1	13 mm	**Order No** = (7)
Type:	with tapered hea	**Order No** = (6)
Execution:	blank	**Order No** = (0)
Punch:	with ejector pin	= 27

PUNCH WITH TAPERED HEAD, STEPPED, ROUND, WITH EJECTOR PIN, DIN 5118 SHAPE F

2716.



2716. Punch with tapered head, stepped, round, with ejector pin, DIN 5118 Shape F

d_1 / Order No	d_2	p	l_1 / Order No	a	k	r	l (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)
5 / (3)	7	1.6-4.9	13 (3) 19 (4)	1.5	4	10		●	●	●	●	●
6 / (4)	9	2.5-5.9	13 (3) 19 (4)	1.5	4	10		●	●	●	●	●
8 / (5)	11	2.5-7.9	19 (4) 25 (5)	1.5	4	12		●	●	●	●	●
10 / (6)	14	4.0-9.9	19 (4) 25 (5)	1.5	4	15		●	●	●	●	●
13 / (7)	17	5.0-12.9	19 (4) 25 (5)	1.5	4	15		●	●	●	●	●
16 / (8)	20	8.0-15.9	19 (4) 25 (5)	1.5	4	15		●	●	●	●	●
20 / (9)	25	12.0-19.9	19 (4) 25 (5)	1.5	4	15		●	●	●	●	●

Ordering Code (example):

2716.7G4.0720

Shape: round		
P = ø7,2 mm		= 0720
Punch cutting length: l_1		**Order No**
19 mm		= (4)
Length: l		**Order Code character**
100 mm		= (G)
Diameter: d_1		**Order No**
13 mm		= (7)
Type:		**Order No**
with tapered hea		= (6)
Execution:		**Order No**
round		= (1)
Punch:		
with ejector pin		= 27

Material:
HSS
Hardness:
Shaft 62-66 HRC
Head 45-55 HRC

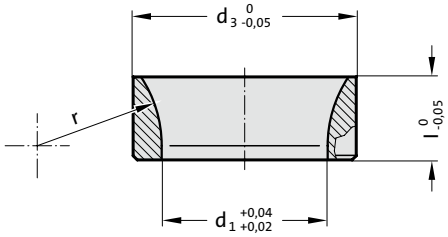
☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Shaft precision ground. Head subsequently hot upset-forged and tempered.

Note:
Matching piloted counterbore 2284.00.
Matching retainer ring2284.00.01.

MOUNTING RING FOR PUNCH WITH TAPERED HEAD

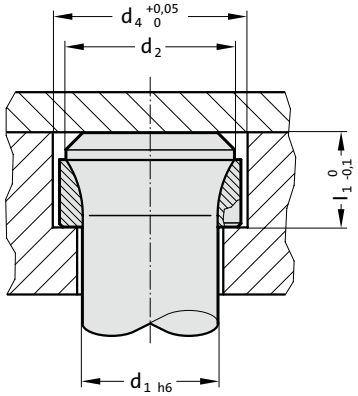
2284.00.01.



2284.00.01. Mounting ring for punch with tapered head

Order No	d_1	d_2	d_3	d_4	l	l_1	r
2284.00.01.0300	3	4.5	5.9	6	4	7	6.5
2284.00.01.0400	4	5.5	6.9	7	4	8	8
2284.00.01.0500	5	7	8.9	9	7	11	10
2284.00.01.0600	6	9	10.9	11	7	11	10
2284.00.01.0800	8	11	12.9	13	8	12	12
2284.00.01.1000	10	14	15.9	16	9	13	15
2284.00.01.1300	13	17	18.9	19	9	13	15
2284.00.01.1600	16	20	21.9	22	9	13	15
2284.00.01.2000	20	25	26.9	27	10	14	15

Mounting example



Material:
Tool steel, heat-treated

Note:
Used for punch with tapered neck

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

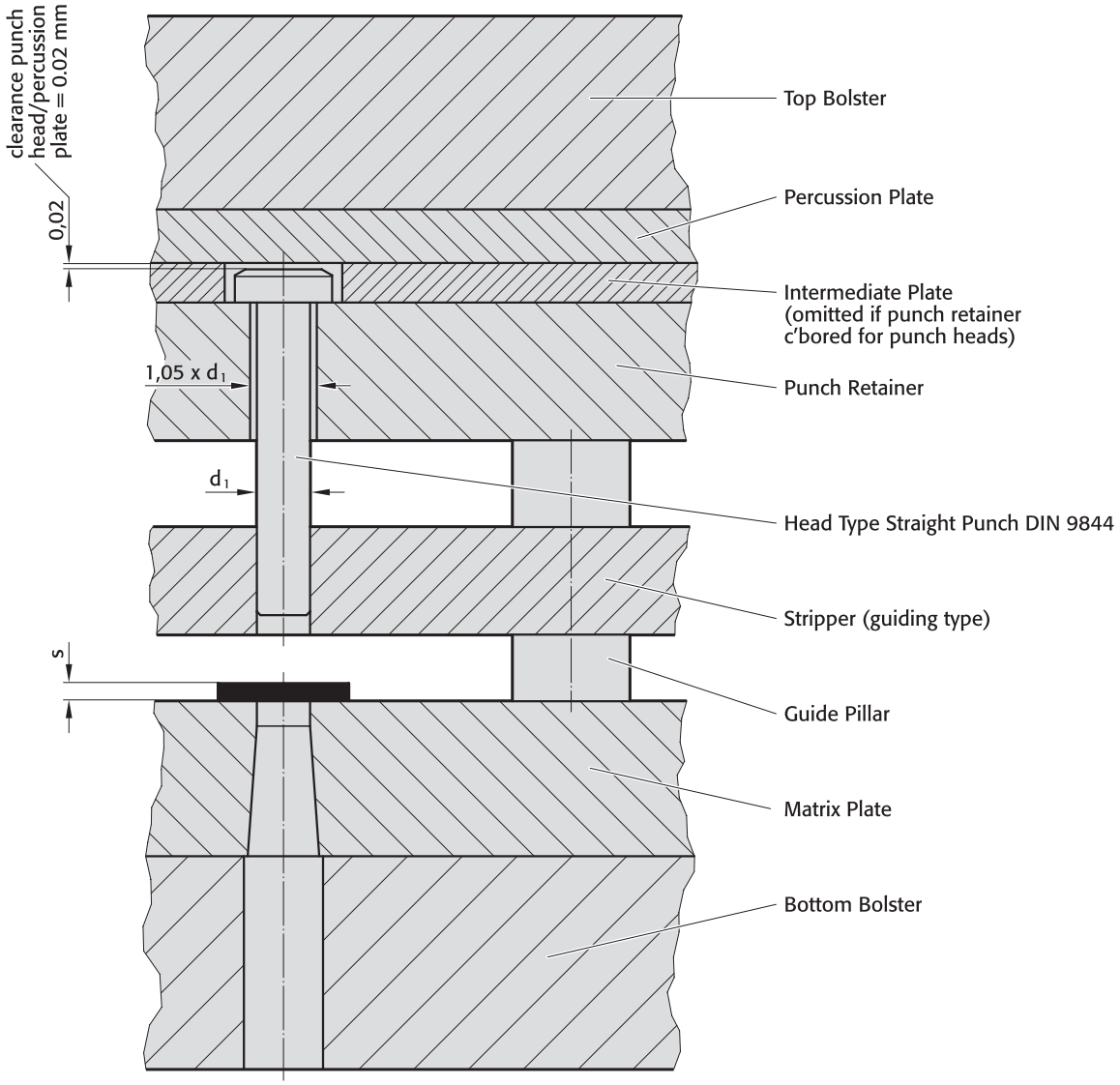
stripping force*, for d_1 from 1 to 5 mm: approx. 20 % of piercing force
ditto . . ., for d_1 from 5 to 16 mm: approx. 10 % of piercing force

*applicable to stock not exceeding 400 N/mm² shear strength

Punch retainer: steel of at least 300 N/mm² tensile strength

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

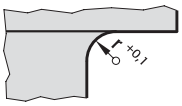
Clearance punch head/percussion plate = 0,02 mm.

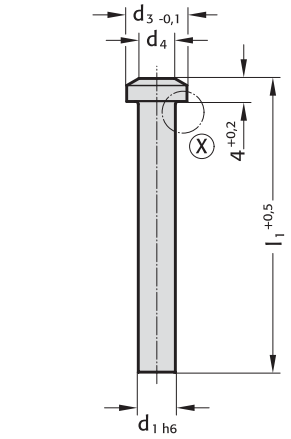


Punch DIN 9844, Shape A

220.

Detail Ⓧ
normal execution
with radius





$d_4 = d_1^{+0,5}$

Material:

HSS
Order No 220.3.
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 3 HRC

HST
Order No 220.4.
Hardness:
Surface ≥ 950 HV 0,3
Head 52 ± 3 HRC

Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

Punch head hot upset-forged.
Shaft and shoulder precision plunge-ground.

Stock lenghts: 71, 90, 112 mm.
other lengths and diameters on request!

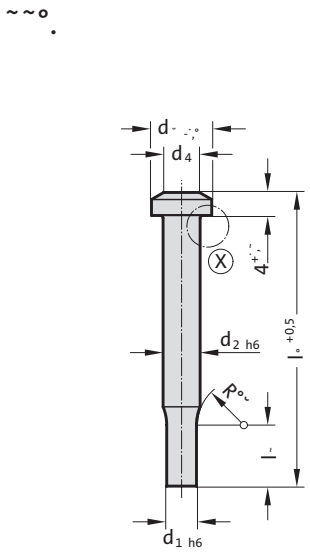
220. Punch DIN 9844, Shape A

	Gradation						
d_1	d_1	d_3	r	l_1	71	90	112
2 - 2.2	0.1	3.6	0.2		●	●	●
2.3 - 2.5	0.1	4	0.2		●	●	●
2.6 - 2.8	0.1	4.5	0.3		●	●	●
2.9 - 3.2	0.1	5	0.3		●	●	●
3.3 - 3.5	0.1	6	0.3		●	●	●
3.6 - 4	0.1	7	0.3		●	●	●
4.1 - 4.5	0.1	8	0.5		●	●	●
4.6 - 5	0.1	8.5	0.5		●	●	●
5.1 - 5.4	0.1	9	0.5		●	●	●
5.5 - 5.9	0.1	9.5	0.5		●	●	●
6 - 6.4	0.1	10	0.5		●	●	●
6.5 - 7	0.5	10.8	0.7		●	●	●
7.5 - 8	0.5	12	0.7		●	●	●
8.5 - 9	0.5	13	0.7		●	●	●
9.5 - 10	0.5	14.5	0.7		●	●	●
10.5 - 11	0.5	16	1		●	●	●
11.5 - 12.5	0.5	18	1		●	●	●
13 - 14.5	0.5	20	1		●	●	●
15 - 16	0.5	22	1		●	●	●

Ordering Code (example):

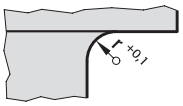
Punch DIN 9844, Shape A		=	220.		
Material MAT	HSS	=	3.		
Cutting diameter d_1	2 mm	=		0200.	
Length l_1	71 mm	=			071
Order No		=	220.	3. 0200.	071

Punch DIN 9844, Shape B



$d_4 = d^{+0,5}$

Detail X
normal execution
with radius



221. Punch DIN 9844, Shape B

d_1	Gradation d_1	d_2	d_3	l_2	r	l_1	71	90	112
0.1 - 1.9	0.05	2	3.6	7	0.2		●	●	●
1.95 - 2.4	0.05	2.5	4	7	0.2		●	●	●
2.5 - 3.1	0.1	3.2	5	7	0.3		●	●	●
3.2 - 3.9	0.1	4	7	7	0.3		●	●	●
4 - 4.9	0.1	5	8.5	7	0.5		●	●	●
5 - 6.2	0.1	6.3	10	7	0.5		●	●	●
6.3 - 7.9	0.1	8	12	16	0.7		●	●	●
8 - 9.9	0.1	10	14.5	16	0.7		●	●	●
10 - 12.4	0.1	12.5	18	16	1		●	●	●
12.5 - 15.9	0.1	16	22	16	1		●	●	●

Material:

HSS
Order No 221.3.
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 3 HRC

HST
Order No 221.4.
Hardness:
Surface ≥ 950 HV 0,3
Head 52 ± 3 HRC

Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

Punch head hot upset-forged.
Shaft and shoulder precision plunge-ground.

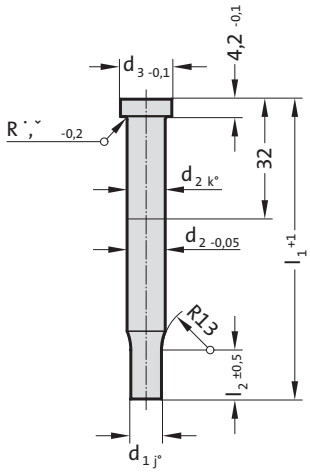
Stock lenghts: 71, 90, 112 mm.
other lengths and diameters on request!

Ordering Code (example):

Punch DIN 9844, Shape B		=	221.		
Material MAT	HSS	=	3.		
Cutting diameter d_1	0.1 mm	=		0010.	
Length l_1	71 mm	=			071
Order No		=	221.	3. 0010.	071

Punch similar to VDI 3374

266.



Material:

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

Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

Punch head hot upset-forged.
Shaft and shoulder precision plunge-ground.

Stock lenghts: 71, 80 mm.
other lengths and diameters on request!

266. Punch similar to VDI 3374

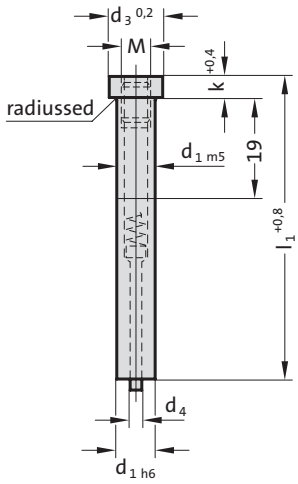
	Gradation						
d_1	d_1	d_2	d_3	l_2	l_1 +1	71	80
5 - 8.9	0.1	10	13	13		●	●
9 - 11.9	0.1	13	16	13		●	●
12 - 15.9	0.1	16	19	13		●	●
16 - 19.5	0.5	20	24	13		●	●
20 - 24.5	0.5	25	29	13		●	●

Ordering Code (example):

Punch similar to VDI 3374		=	266.
Material MAT	HSS	=	3.
Cutting diameter d_1	5 mm	=	0500.
Length l_1	71 mm	=	071
Order No		=	266. 3. 0500. 071

Punch with ejector pin

267.



267. Punch with ejector pin

$d_{1\,h6}$	d_3	d_4	k	l_1	l_1	l_1	l_1	M
				60	71	80	90	
5	8	0.45	5	●	●			M2.5
6	9	0.7	5	●	●	●	●	M3
8	11	1.04	5	●	●	●	●	M4
10	13	1.47	5	●	●	●	●	M5
13	16	1.47	5	●	●	●	●	M5
16	19	2.26	6.4	●	●	●	●	M6
20	23	2.26	6.4	●	●	●	●	M6
25	28	2.26	6.4	●	●	●	●	M6

Material:

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

Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

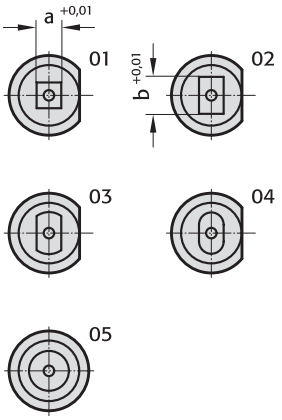
Punch head hot upset-forged.
Shaft and shoulder precision plunge-ground.

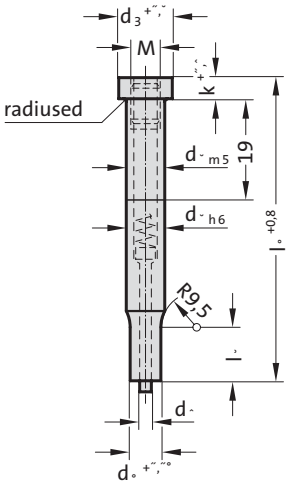
Ordering Code (example):

Punch with ejector pin		=	267.			
Material MAT	HSS	=		3.		
Shaft diameter d_1	5 mm	=			0500.	
Length l_1	60 mm	=				060
Order No		=	267.	3.	0500.	060

Punch with ejector pin, stepped, short point

268.





Material:

HSS
Order No 268.3.
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 3 HRC

Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

Punch head hot upset-forged.
Shaft and shoulder precision plunge-ground.

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

268. Punch with ejector pin, stepped, short point

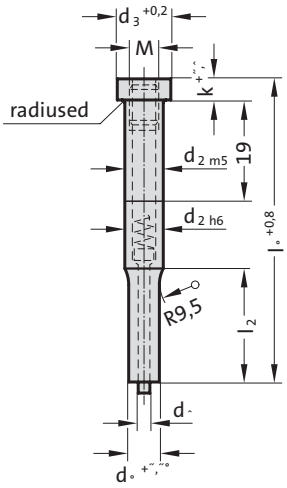
d_1	d_2	d_3	d_4	k	l_2	l_1	l_1	l_1	l_1	a_{min}	M
						60	71	80	90		
1.6 - 4.9	5	8	0.45	5	7	●	●			1.6	M2.5
2.3 - 5.9	6	9	0.7	5	7	●	●	●	●	2.3	M3
3.2 - 7.9	8	11	1.04	5	13	●	●	●	●	3.2	M4
4.8 - 9.9	10	13	1.47	5	13	●	●	●	●	4.8	M5
4.8 - 12.9	13	16	1.47	5	13	●	●	●	●	4.8	M5
5.5 - 15.9	16	19	2.26	6.4	13	●	●	●	●	5.5	M6
5.5 - 19.9	20	23	2.26	6.4	13	●	●	●	●	5.5	M6
6.5 - 24.9	25	28	2.26	6.4	13	●	●	●	●	6.5	M6

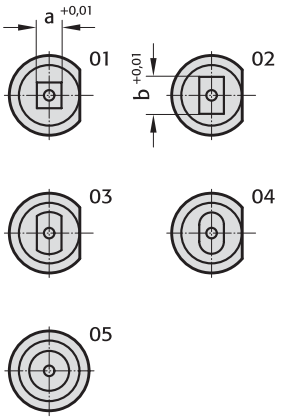
Ordering Code (example):

Punch with ejector pin, stepped, short point		=	268.						
Shaft diameter d_2	5 mm	=		0500.					
Length l_1	60 mm	=			060.				
Die shape FORM	Square	=				01.			
Die shape width a	1.6 mm	=					0160.		
Die shape length b	1.6 mm	=						0160	
Order No		=	268.	0500.	060.	01.	0160.	0160	

Punch with ejector pin, stepped, long point

269.





269. Punch with ejector pin, stepped, long point

d_1	d_2	d_3	d_4	k	l_2	l_1 60	l_1 71	l_1 80	l_1 90	a_{min}	M
2.3 - 5.9	6	9	0.7	5	17.5	●	●	●	●	2.3	M3
3.2 - 7.9	8	11	1.04	5	25	●	●	●	●	3.2	M4
4.8 - 9.9	10	13	1.47	5	28	●	●	●	●	4.8	M5
4.8 - 12.9	13	16	1.47	5	28	●	●	●	●	4.8	M5
5.5 - 15.9	16	19	2.26	6.4	28	●	●	●	●	5.5	M6
5.5 - 19.9	20	23	2.26	6.4	28	●	●	●	●	5.5	M6
6.5 - 24.9	25	28	2.26	6.4	28	●	●	●	●	6.5	M6

Material:

HSS
Order No 269.3.
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 3 HRC

Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

Punch head hot upset-forged.
Shaft and shoulder precision plunge-ground.

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

Ordering Code (example):

Punch with ejector pin, stepped, long point		=	269.3.					
Shaft diameter d_2	6 mm	=		0600.				
Length l_1	60 mm	=			060.			
Die shape FORM	Square	=				01.		
Die shape width a	2.3 mm	=					0230.	
Die shape length b	2.3 mm	=						0230
Order No		=	269.3.	0600.	060.	01.	0230.	0230

Sintered Hard Metal
HIP-densified

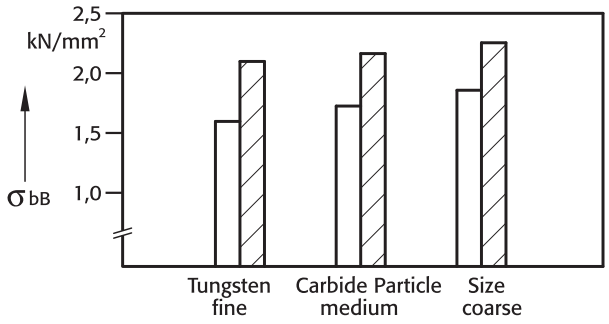
The HIP process (hot isostatic pressing) consists of a special densification treatment.

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.

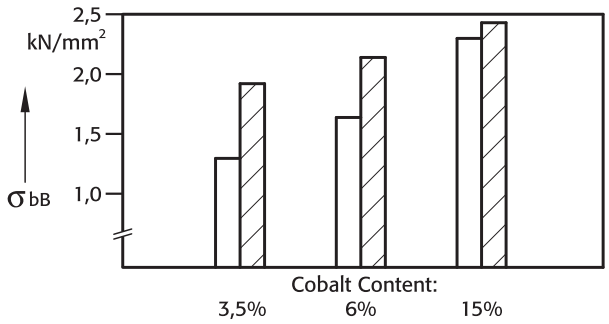
For stamping die tooling, hard metal types of medium tungsten particle size, with a cobalt content of 9 to 12%, have been found succesful in a wide field of applications.

Tensile strength of Tungsten – 6% Cobalt Carbide in the sintered-only versus HIP-densified state, in dependance of Cristallite 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 dependance of total Cobalt content



b) influence of cobalt content
Porosity in the sintered-only state: ≧ A1
(left: sintered only – right: sintered and HIP-treated)

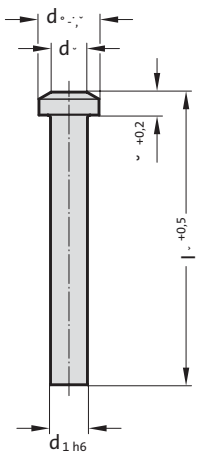
Flexural strength and HV30-hardness of Tungsten-Cobalt Carbides with/ without HIP-treatment and in dependance of Tungsten Carbide particle size and Cobalt content.

Change of Sintered Hard Metal by hot isostatic pressing

Tungsten carbide – particle size	Co %	HV_{30}-Hardness		Flexural Strength N/mm²	
		befor	after	befor	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

Punch similar DIN 9844, Shape A

270.



d = d +0,5

Material:
Tungsten-Cobalt-Carbide
Order No 270.9.

Execution:
Shaft precision ground.
Head: Steel, brazed to shaft or Tungsten-Cobalt Carbide.

Other diameters and lengths on request.

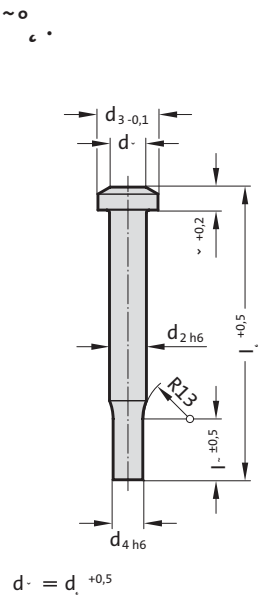
270. Punch similar DIN 9844, Shape A

	Gradation						
d_1	d_1	d_3	r	l_1	71	90	112
1 - 2.2	0.1	3.6	0.2		●	●	●
2.3 - 2.5	0.1	4	0.2		●	●	●
2.6 - 2.8	0.1	4.5	0.3		●	●	●
2.9 - 3.2	0.1	5	0.3		●	●	●
3.3 - 3.5	0.1	6	0.3		●	●	●
3.6 - 4	0.1	7	0.3		●	●	●
4.1 - 4.5	0.1	8	0.5		●	●	●
4.6 - 5	0.1	8.5	0.5		●	●	●
5.1 - 5.4	0.1	9	0.5		●	●	●
5.5 - 5.9	0.1	9.5	0.5		●	●	●
6 - 6.4	0.1	10	0.5		●	●	●
6.5 - 7	0.5	10.8	0.7		●	●	●
7.5 - 8	0.5	12	0.7		●	●	●
8.5 - 9	0.5	13	0.7		●	●	●
9.5 - 10	0.5	14.5	0.7		●	●	●
10.5 - 11	0.5	16	1		●	●	●
11.5 - 12.5	0.5	18	1		●	●	●
13 - 14.5	0.5	20	1		●	●	●
15 - 16	0.5	22	1		●	●	●

Ordering Code (example):

Punch similar DIN 9844, Shape A		=	270.9.	
Shaft diameter d_1	1 mm	=	0100.	
Length l_1	71 mm	=		071
Order No		=	270.9. 0100.	071

Punch similar DIN 9844, Shape B



$d_1 = d_1^{+0,5}$

271. Punch similar DIN 9844, Shape B

d_1	Gradation d_1	d_2	d_3	l_2	r	l_1	71	90	112
0.5 - 1.9	0.05	2	3.6	7	0.2		●	●	●
1.95 - 2.4	0.05	2.5	4	7	0.2		●	●	●
2.5 - 3.1	0.1	3.2	5	7	0.3		●	●	●
3.2 - 3.9	0.1	4	7	7	0.3		●	●	●
4 - 4.9	0.1	5	8.5	7	0.5		●	●	●
5 - 6.2	0.1	6.3	10	7	0.5		●	●	●
6.3 - 7.9	0.1	8	12	16	0.7		●	●	●
8 - 9.9	0.1	10	14.5	16	0.7		●	●	●
10 - 12.4	0.1	12.5	18	16	1		●	●	●
12.5 - 15.9	0.1	16	22	16	1		●	●	●

Material:

Tungsten-Cobalt-Carbide
Order No 271.9.

Execution:

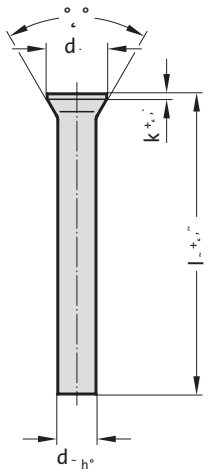
Shaft precision ground.
Head: Steel, brazed to shaft or Tungsten-Cobalt Carbide.

Other diameters and lengths on request.

Ordering Code (example):

Punch similar DIN 9844, Shape B		= 271.9.		
Cutting diameter d_1	0.5 mm	=	0050.	
Length l_1	71 mm	=		071
Order No		= 271.9.	0050.	071

Punch similar DIN 9861, Shape D



Material:

Tungsten-Cobalt-Carbide
Order No 272.9.

Execution:

Shaft precision ground.
Head: Steel, brazed to shaft or Tungsten-Cobalt Carbide.

Other diameters and lengths on request.

272. Punch similar DIN 9861, Shape D

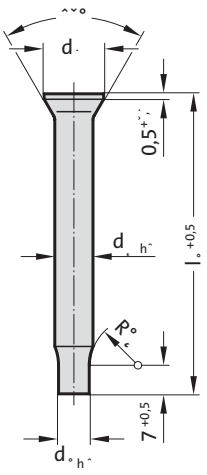
	Gradation						
d_1	d_1	d_2	k	l_1	71	80	100
1.5	0.1	2.2	0.5		●	●	●
1.6 - 1.7	0.1	2.5	0.5		●	●	●
1.8 - 1.9	0.1	2.8	0.5		●	●	●
2	0.1	3	0.5		●	●	●
2.1 - 2.2	0.1	3.2	0.5		●	●	●
2.3 - 2.5	0.1	3.5	0.5		●	●	●
2.6 - 2.9	0.1	4	0.5		●	●	●
3 - 3.4	0.1	4.5	0.5		●	●	●
3.5 - 3.9	0.1	5	0.5		●	●	●
4 - 4.4	0.1	5.5	0.5		●	●	●
4.5 - 4.9	0.1	6	0.5		●	●	●
5 - 5.4	0.1	6.5	0.5		●	●	●
5.5 - 5.9	0.1	7	0.5		●	●	●
6 - 6.4	0.1	8	0.5		●	●	●
6.5 - 7	0.5	9	1		●	●	●
7.5 - 8	0.5	10	1		●	●	●
8.5 - 9	0.5	11	1		●	●	●
9.5 - 10	0.5	12	1		●	●	●
10.5 - 11	0.5	13	1		●	●	●
11.5 - 12	0.5	14	1		●	●	●
12.5 - 13	0.5	15	1		●	●	●
13.5 - 14	0.5	16	1.5		●	●	●
14.5 - 15	0.5	17	1.5		●	●	●
15.5 - 16	0.5	18	1.5		●	●	●

Ordering Code (example):

Punch similar DIN 9861, Shape D		=	272.9.		
Shaft diameter d_1	1.5 mm	=		0150.	
Length l_1	71 mm	=			071
Order No		=	272.9.	0150.	071

Punch similar DIN 9861, Shape C

273.



273. Punch similar DIN 9861, Shape C

	Gradation			
d_1	d_1	d_2	d_3	l_1
0.5 - 1.5	0.05	3	2	71
1.55 - 2.95	0.05	4.5	3	71

Material:

Tungsten-Cobalt-Carbide
Order No 273.9.

Execution:

Shaft precision ground.
Head: Steel, brazed to shaft or Tungsten-Cobalt Carbide.

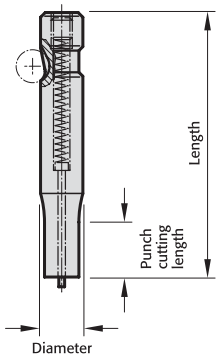
Other diameters and lengths on request.

Ordering Code (example):

Punch similar DIN 9861, Shape C		=	273.9.		
Cutting diameter d_1	0.5 mm	=		0050.	
Length l_1	71 mm	=			071
Order No		=	273.9.	0050.	071

Ball-Lock Punches

Ordering example
Ball-Lock Punches



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

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

Format: Slot length P = 6,5 mm

Format: Slot width W = 4,5 mm

Punch:
22 without ejector pin
27 with ejector pin

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

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

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

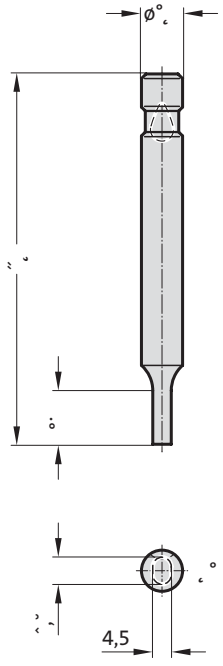
Diameter: d_2	Order No
6 (light duty only)	= 1
10	= 2
13	= 3
16	= 4
20	= 5
25	= 6
32	= 7
38 (light duty only)	= 8
40 (heavy duty only)	= 9

Lenght: 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

Ordering Code (Example):

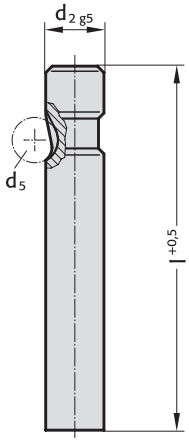
2 2 4 2 . 2 F 1 . 0 6 5 0 . 0 4 5 0 B

- Angle = 90° (B)
- Format: Slot, width W = 4,5 mm (0450)
- Format: Slot, length P = 6,5 mm (0650)
- Punch cutting 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 punch, blank, light duty

2202.



2202. Ball lock punch, blank, light duty

d_2 / (Order No)	d_5	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)	140 (K)	150 (I)	175 (M)	200 (N)
6 / (1)	6		●	●	●	●	●						
10 / (2)	8		●	●	●	●	●	●	●				
13 / (3)	8		●	●	●	●	●	●	●	●	●	●	
16 / (4)	8		●	●	●	●	●	●	●	●	●	●	
20 / (5)	8		●	●	●	●	●	●	●	●	●	●	
25 / (6)	8		●	●	●	●	●	●	●	●	●	●	●
32 / (7)	8			●	●	●	●	●	●	●	●	●	●
38 / (8)	8				●	●	●	●	●	●	●	●	●

Ordering code (example):

2 2 0 2 . 7 G

Length: l	**Order Code character**
100 mm	= (G)
Diameter: d_2	**Order No**
32 mm	= (7)
Type:	**Order No**
light	= (2)
Version:	**Order No**
blank	= (0)
Punch:	
without ejector pin	= 22

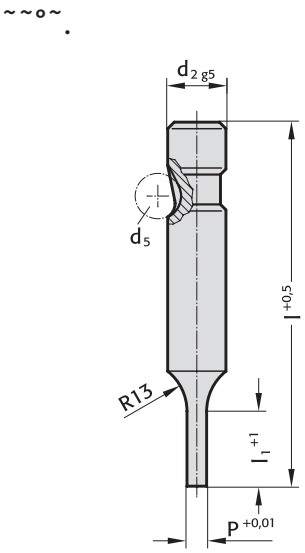
Material:

HSS
Hardness 62 ± 2 HRC

Execution:

Shaft fine ground.
Special dimensions on request.

Ball lock punch, stepped, round, light duty



2212. Ball lock punch, stepped, round, light duty

d_2 / (Order No)	d_5	P	l_1 / (Order No)*	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 / (1)	6	1,6-5,9	13 (1)		●	●	●	●	●
10 / (2)	8	1,6-9,9	13 (1) 19 (2)		●	●	●	●	●
13 / (3)	8	5,0-12,9	13 (1) 19 (2)		●	●	●	●	●
16 / (4)	8	8,0-15,9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
20 / (5)	8	12,0-19,9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
25 / (6)	8	16,0-24,9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
32 / (7)	8	24,0-31,9	13 (1) 19 (2) 25 (3)			●	●	●	●
38 / (8)	8	30,0-37,9	19 (2) 25 (3) 30 (4)				●	●	●

*l_1=10 where P < 2.20

Material:

HSS
Hardness 62 ± 2 HRC

Execution:

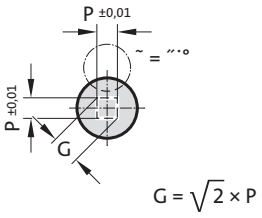
Shaft and punch diameter fine ground.
Special dimensions on request.

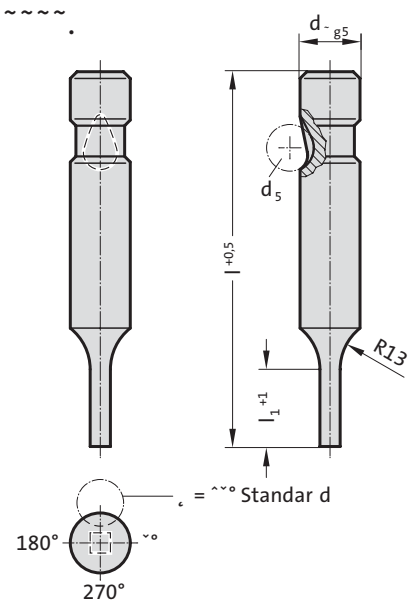
Ordering-code (example):

2212.7G2.2450

Format: Round
P = ø24,5 mm = 2450
Punch cutting length: l_1 **Order No**
19 mm = (2)
length: l **Order code character**
100 mm = (G)
diameter: d_2 **Order No**
32 mm = (7)
Type: **Order No**
light = (2)
Version: **Order No**
Round = (1)
Punch:
without ejector pin = 22

Ball lock punch, stepped, square, light duty





2222. Ball lock punch, stepped, square, light duty

d_2 / (Order No)	d_5	P_{min}	G_{max}	l_1 / (Order No)*	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 / (1)	6	1.6	5.9	13 (1)		●	●	●	●	●
10 / (2)	8	1.6	9.9	13 (1) 19 (2)		●	●	●	●	●
13 / (3)	8	4.5	12.9	13 (1) 19 (2)		●	●	●	●	●
16 / (4)	8	6	15.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
20 / (5)	8	8	19.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
25 / (6)	8	10	24.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
32 / (7)	8	12.5	31.9	13 (1) 19 (2) 25 (3)			●	●	●	●
38 / (8)	8	14	37.9	19 (2) 25 (3) 30 (4)				●	●	●

*l_1=10 where P < 2.20

Ordering-code (example):

2 2 2 2 . 2 F 1 . 0 6 5 0 B

Angle:	90°	**Order code character** = (B)
Format: Square, length P		
P = 6,5 mm		= 0650
Punch cutting length: l_1		**Order No**
13 mm		= (1)
Length: l		**Order code character**
90 mm		= (F)
Diameter: d_2		**Order No**
10 mm		= (2)
Type:		**Order No**
light		= (2)
Version:		**Order No**
Square		= (2)
Punch:		
without ejector pin		= 22

Material:

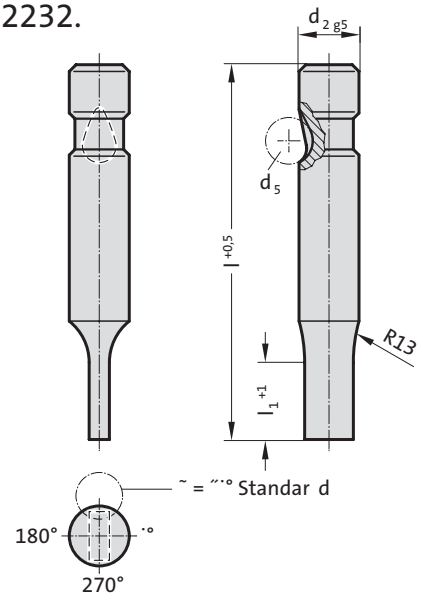
HSS
Hardness 62 ± 2 HRC

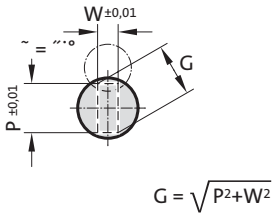
Execution:

Shaft and punch shape fine ground.
Special dimensions on request.

Ball lock punch, stepped, rectangular, light duty

2232.





2232. Ball lock punch, stepped, rectangular, light duty

d_2 / (Order No)	d_5	W_{min}	G_{max}	l_1 / (Order No)*	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 / (1)	6	1.6	5.9	13 (1)		●	●	●	●	●
10 / (2)	8	1.6	9.9	13 (1) 19 (2)		●	●	●	●	●
13 / (3)	8	4.5	12.9	13 (1) 19 (2)		●	●	●	●	●
16 / (4)	8	6	15.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
20 / (5)	8	8	19.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
25 / (6)	8	10	24.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
32 / (7)	8	12.5	31.9	13 (1) 19 (2) 25 (3)			●	●	●	●
38 / (8)	8	14	37.9	19 (2) 25 (3) 30 (4)				●	●	●

*l_1=10 where W < 2.20

Material:

HSS
Hardness 62 ± 2 HRC

Execution:

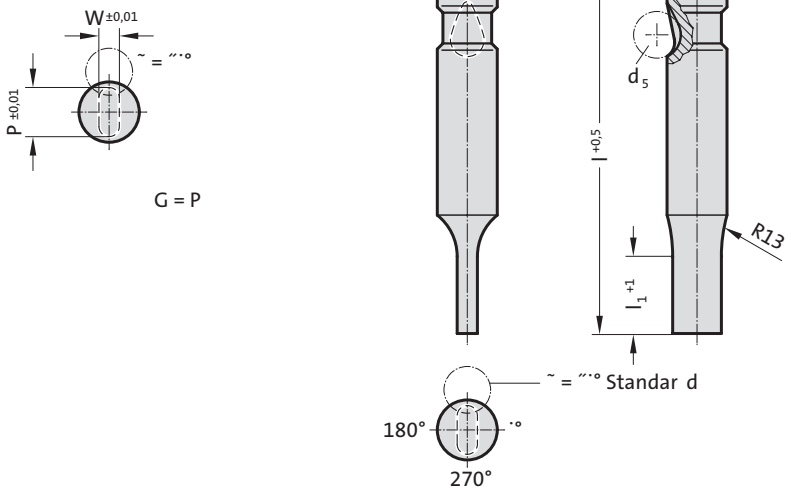
Shaft and punch shape fine ground.
Special dimensions on request.

Ordering-code (example):

2 2 3 2 . 2 F 1 . 0 6 5 0 . 0 4 5 0 B

Angle:	**Order code character**
90°	= (B)
Format: Rectangular, width W	
W = 4,5 mm	= 0450
Format: Rectangular, length P	
P = 6,5 mm	= 0650
Punch cutting length: l_1	**Order No**
13 mm	= (1)
Length: l	**Order code character**
90 mm	= (F)
Diameter: d_2	**Order No**
10 mm	= (2)
Type:	**Order No**
light	= (2)
Version:	**Order No**
Rectangular	= (3)
Punch:	
without ejector pin	= 22

Ball lock punch, stepped, slot, light duty



2242. Ball lock punch, stepped, slot, light duty

d_2 / (Order No)	d_5	W_{min}	G_{max}	l_1 / (Order No)*	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 / (1)	6	1.6	5.9	13 (1)		●	●	●	●	●
10 / (2)	8	1.6	9.9	13 (1) 19 (2)		●	●	●	●	●
13 / (3)	8	4.5	12.9	13 (1) 19 (2)		●	●	●	●	●
16 / (4)	8	6	15.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
20 / (5)	8	8	19.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
25 / (6)	8	10	24.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
32 / (7)	8	12.5	31.9	13 (1) 19 (2) 25 (3)			●	●	●	●
38 / (8)	8	14	37.9	19 (2) 25 (3) 30 (4)				●	●	●

*l_1=10 where W < 2.20

Ordering-code (example):

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

	Angle	**Order code character**
	90°	= (B)
	Format: Slot, width W	
	W = 4,5 mm	= 0450
	Format: Slot, length P	
	P = 6,5 mm	= 0650
	Punch cutting length: l_1	**Order No**
	13 mm	= (1)
	Length: l	**Order code character**
	90 mm	= (F)
	Diameter: d_2	**Order No**
	10 mm	= (2)
	Type:	**Order No**
	light	= (2)
	Version:	**Order No**
	Slot	= (4)
	Punch:	
	without ejector pin	= 22

Material:

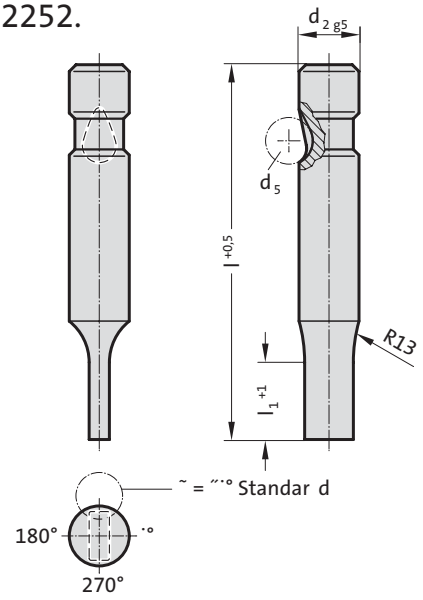
HSS
Hardness 62 ± 2 HRC

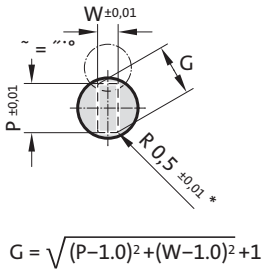
Execution:

Shaft and punch shape fine ground.
Special dimensions on request.

Ball lock punch, stepped, rectangle with radiussed corners, light duty

2252.





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

2252. Ball lock punch, stepped, rectangle with radiussed corners, light duty

d_2 / (Order No)	d_5	W_{min}	G_{max}	l_1 / (Order No)*	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 / (1)	6	1.6	5.9	13 (1)		●	●	●	●	●
10 / (2)	8	1.6	9.9	13 (1) 19 (2)		●	●	●	●	●
13 / (3)	8	4.5	12.9	13 (1) 19 (2)		●	●	●	●	●
16 / (4)	8	6	15.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
20 / (5)	8	8	19.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
25 / (6)	8	10	24.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
32 / (7)	8	12.5	31.9	13 (1) 19 (2) 25 (3)			●	●	●	●
38 / (8)	8	14	37.9	19 (2) 25 (3) 30 (4)				●	●	●

*l_1=10 where W < 2.20

CAD

Material:

HSS
Hardness 62 ± 2 HRC

Execution:

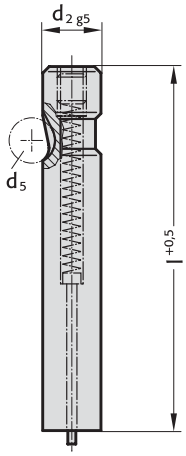
Shaft and punch shape fine ground.
Special dimensions on request.
* For other radius options, see standardised special shapes.

Ordering-code (example):

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

Angle:	**Order code character**
90°	= (B)
Format: Rectangle with radiused corners, width W	
W = 4,5 mm	= 0450
Format: Rectangle with radiused corners, length P	
P = 6,5 mm	= 0650
Punch cutting length: l_1	**Order No**
13 mm	= (1)
Length: l	**Order code character**
90 mm	= (F)
Diameter: d_2	**Order No**
10 mm	= (2)
Type:	**Order No**
light	= (2)
Version:	**Order No**
Rectangle with radiused corners	= (5)
Punch:	
without ejector pin	= 22

Ball lock punch, blank, with ejector pin, light duty



2702. Ball lock punch, blank, with ejector pin, light duty

d_2 / (Order No)	d_5	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 / (1)	6		●	●	●	●	●
10 / (2)	8		●	●	●	●	●
13 / (3)	8		●	●	●	●	●
16 / (4)	8		●	●	●	●	●
20 / (5)	8		●	●	●	●	●
25 / (6)	8		●	●	●	●	●
32 / (7)	8			●	●	●	●
38 / (8)	8				●	●	●

Ordering-code (example):

2 7 0 2 . 7 G

Length: l		**Order code character**
100 mm		= (G)
Diameter: d_2		**Order No**
32 mm		= (7)
Type:		**Order No**
light		= (2)
Version:		**Order No**
blank		= (0)
Punch:		
with ejector pin		= 27

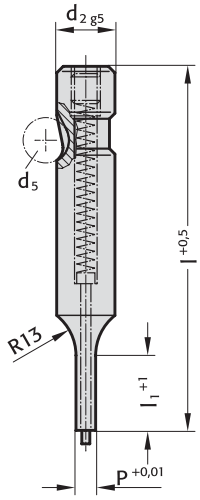
Material:

HSS
Hardness 62 ± 2 HRC

Execution:

Shaft fine ground.
Special dimensions on request.

Ball lock punch, stepped, round, with ejector pin, light duty



2712. Ball lock punch, stepped, round, with ejector pin, light duty

d_2 / (Order No)	d_5	P	l_1 / (Order No)*	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 / (1)	6	1,6-5,9	13 (1)		●	●	●	●	●
10 / (2)	8	1,6-9,9	13 (1) 19 (2)		●	●	●	●	●
13 / (3)	8	5,0-12,9	13 (1) 19 (2)		●	●	●	●	●
16 / (4)	8	8,0-15,9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
20 / (5)	8	12,0-19,9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
25 / (6)	8	16,0-24,9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
32 / (7)	8	24,0-31,9	13 (1) 19 (2) 25 (3)			●	●	●	●
38 / (8)	8	30,0-37,9	19 (2) 25 (3) 30 (4)				●	●	●

*l_1=10 where P < 2.20

Material:

HSS
Hardness 62 ± 2 HRC

Execution:

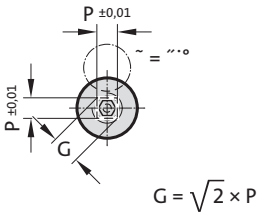
Shaft and punch diameter fine ground.
Special dimensions on request.

Ordering-code (example):

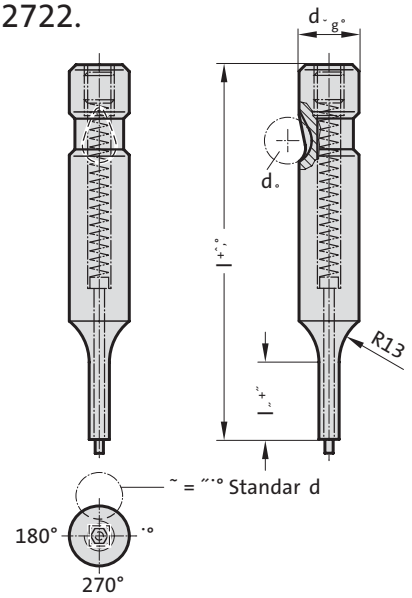
2712.7G2.2450

Format: Round
P = ø24,5 mm = 2450
Punch cutting length: l_1 **Order No**
19 mm = (2)
length: l **Order code character**
100 mm = (G)
diameter: d_2 **Order No**
32 mm = (7)
Type: **Order No**
light = (2)
Version: **Order No**
Round = (1)
Punch:
with ejector pin = 27

Ball lock punch, stepped, square, with ejector pin, light duty



2722.



2722. Ball lock punch, stepped, square, with ejector pin, light duty

d_2 / (Order No)	d_5	P_{min}	G_{max}	l_1 / (Order No)*	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 / (1)	6	1.6	5.9	13 (1)		●	●	●	●	●
10 / (2)	8	1.6	9.9	13 (1) 19 (2)		●	●	●	●	●
13 / (3)	8	4.5	12.9	13 (1) 19 (2)		●	●	●	●	●
16 / (4)	8	6	15.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
20 / (5)	8	8	19.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
25 / (6)	8	10	24.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
32 / (7)	8	12.5	31.9	13 (1) 19 (2) 25 (3)			●	●	●	●
38 / (8)	8	14	37.9	19 (2) 25 (3) 30 (4)				●	●	●

*l_1=10 where P < 2.20

Ordering-code (example):

2722.2E1.0650A

Angle:	0°	**Order code character** = (A)
Format: Square, length P	P = 6,5 mm	= 0650
Punch cutting length: l_1	13 mm	**Order No** = (1)
Length: l	80 mm	**Order code character** = (E)
Diameter: d_2	10 mm	**Order No** = (2)
Type:	light	**Order No** = (2)
Version:	Square	**Order No** = (2)
Punch:	with ejector pin	= 27

Material:

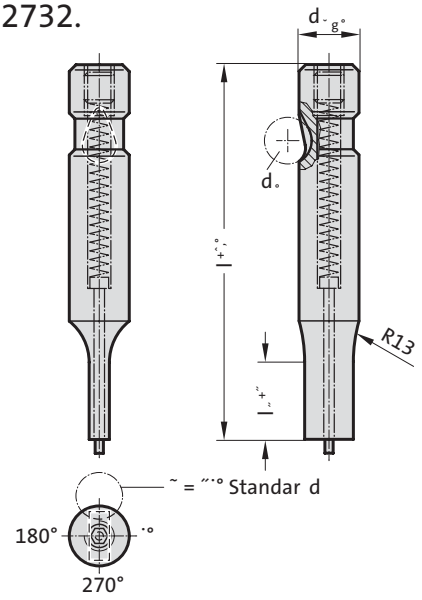
HSS
Hardness 62 ± 2 HRC

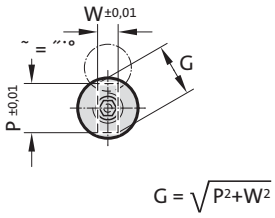
Execution:

Shaft and punch shape fine ground.
Special dimensions on request.

Ball lock punch, stepped, rectangular, with ejector pin, light duty

2732.





2732. Ball lock punch, stepped, rectangular, with ejector pin, light duty

d_2 / (Order No)	d_5	W_{min}	G_{max}	l_1 / (Order No)*	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 / (1)	6	1.6	5.9	13 (1)		●	●	●	●	●
10 / (2)	8	1.6	9.9	13 (1) 19 (2)		●	●	●	●	●
13 / (3)	8	4.5	12.9	13 (1) 19 (2)		●	●	●	●	●
16 / (4)	8	6	15.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
20 / (5)	8	8	19.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
25 / (6)	8	10	24.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
32 / (7)	8	12.5	31.9	13 (1) 19 (2) 25 (3)			●	●	●	●
38 / (8)	8	14	37.9	19 (2) 25 (3) 30 (4)				●	●	●

*l_1=10 where W < 2.20

CAD

Material:

HSS
Hardness 62 ± 2 HRC

Execution:

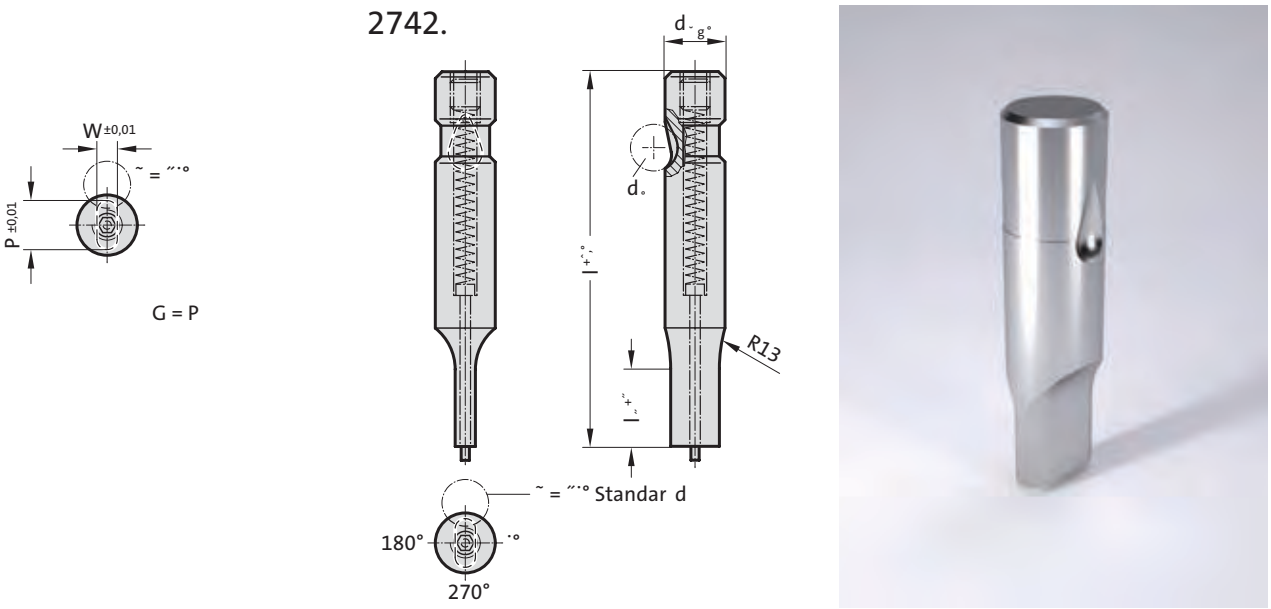
Shaft and punch shape fine ground.
Special dimensions on request.

Ordering-code (example):

2732.2F1.0650.0450B

Angle:	**Order code character**
90°	= (B)
Format: Rectangular, width W	
W = 4,5 mm	= 0450
Format: Rectangular, length P	
P = 6,5 mm	= 0650
Punch cutting length: l_1	**Order No**
13 mm	= (1)
Length: l	**Order code character**
90 mm	= (F)
Diameter: d_2	**Order No**
10 mm	= (2)
Type:	**Order No**
light	= (2)
Version:	**Order No**
Rectangular	= (3)
Punch:	
with ejector pin	= 27

Ball lock punch, stepped, slot, with ejector pin, light duty



2742. Ball lock punch, stepped, slot, with ejector pin, light duty

d_2 / (Order No)	d_5	W_{min}	G_{max}	l_1 / (Order No)*	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 / (1)	6	1.6	5.9	13 (1)		●	●	●	●	●
10 / (2)	8	1.6	9.9	13 (1) 19 (2)		●	●	●	●	●
13 / (3)	8	4.5	12.9	13 (1) 19 (2)		●	●	●	●	●
16 / (4)	8	6	15.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
20 / (5)	8	8	19.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
25 / (6)	8	10	24.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
32 / (7)	8	12.5	31.9	13 (1) 19 (2) 25 (3)			●	●	●	●
38 / (8)	8	14	37.9	19 (2) 25 (3) 30 (4)				●	●	●

*l_1=10 where W < 2.20

Ordering-code (example):

2 7 4 2 . 2 F 1 . 0 6 5 0 . 0 4 5 0 B

Angle		**Order code character**
90°		= (B)
Format: Slot, width W		
W = 4,5 mm		= 0450
Format: Slot, length P		
P = 6,5 mm		= 0650
Punch cutting length: l_1		**Order No**
13 mm		= (1)
Length: l		**Order code character**
90 mm		= (F)
Diameter: d_2		**Order No**
10 mm		= (2)
Type:		**Order No**
light		= (2)
Version:		**Order No**
Slot		= (4)
Punch:		
with ejector pin		= 27

Material:

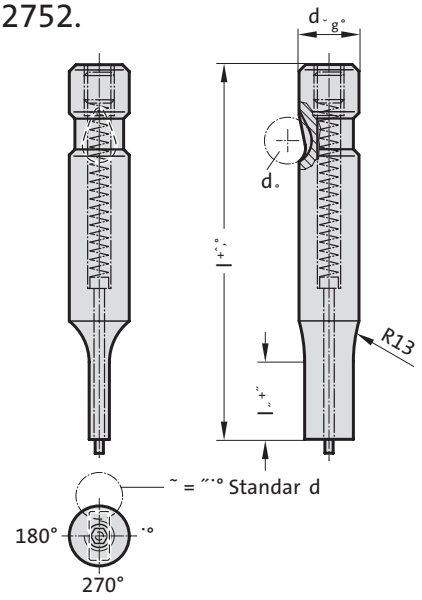
HSS
Hardness 62 ± 2 HRC

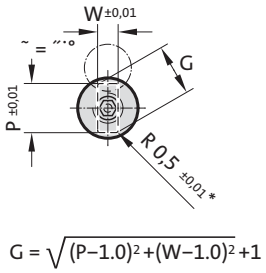
Execution:

Shaft and punch shape fine ground.
Special dimensions on request.

Ball lock punch, stepped, rectangle with radiussed corners, with ejector pin, light duty

2752.





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

2752. Ball lock punch, stepped, rectangle with radiussed corners, with ejector pin, light duty

d_2 / (Order No)	d_5	W_{min}	G_{max}	l_1 / (Order No)*	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 / (1)	6	1.6	5.9	13 (1)		●	●	●	●	●
10 / (2)	8	1.6	9.9	13 (1) 19 (2)		●	●	●	●	●
13 / (3)	8	4.5	12.9	13 (1) 19 (2)		●	●	●	●	●
16 / (4)	8	6	15.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
20 / (5)	8	8	19.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
25 / (6)	8	10	24.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●
32 / (7)	8	12.5	31.9	13 (1) 19 (2) 25 (3)			●	●	●	●
38 / (8)	8	14	37.9	19 (2) 25 (3) 30 (4)				●	●	●

*l_1=10 where W < 2.20

CAD

Material:

HSS
Hardness 62 ± 2 HRC

Execution:

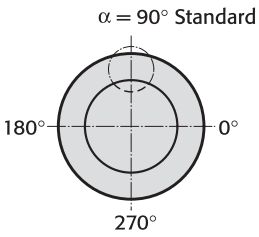
Shaft and punch shape fine ground.
Special dimensions on request.
* For other radius options, see standardised special shapes.

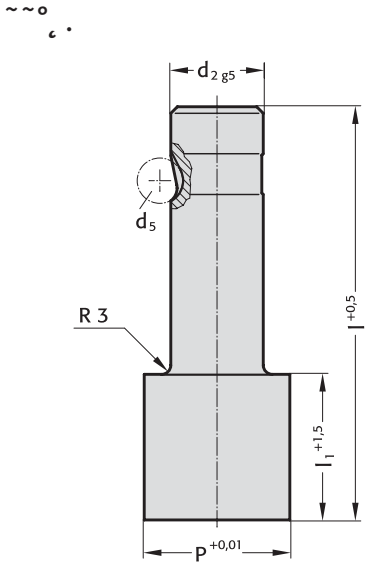
Ordering-code (example):

2752.2F1.0650.0450B

Angle:		**Order code character**
90°		= (B)
Format: Rectangle with radiused corners, width W		
W = 4,5 mm		= 0450
Format: Rectangle with radiused corners, length P		
P = 6,5 mm		= 0650
Punch cutting length: l_1		**Order No**
13 mm		= (1)
Length: l		**Order code character**
90 mm		= (F)
Diameter: d_2		**Order No**
10 mm		= (2)
Type:		**Order No**
light		= (2)
Version:		**Order No**
Rectangle with radiused corners		= (5)
Punch:		
with ejector pin		= 27

Ball lock punch, punch larger than shaft, blank, light duty





2204. Ball lock punch, punch larger than shaft, blank, light duty

d_2 / (Order No)	d_5	P	l_1 / (Order No)	l / (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	8	32	19 (2) 30 (4)		●	●	●
16 / (4)	8	38	19 (2) 30 (4)		●	●	●
20 / (5)	8	40	19 (2) 30 (4)		●	●	●
25 / (6)	8	44	19 (2) 30 (4)		●	●	●
32 / (7)	8	50	19 (2) 30 (4)		●	●	●

Ordering-code (example):

2 2 0 4 . 4 F 4 . 3 8 0 0

Format: Round		
P = ø38,0 mm		= 3800
Punch cutting length: l_1		**Order No**
30 mm		= (4)
length: l		**Order code character**
90 mm		= (F)
diameter: d_2		**Order No**
16 mm		= (4)
Type:		**Order No**
punch larger, light duty		= (4)
Version:		**Order No**
Blank		= (0)
Punch:		
without ejector pin		= 22

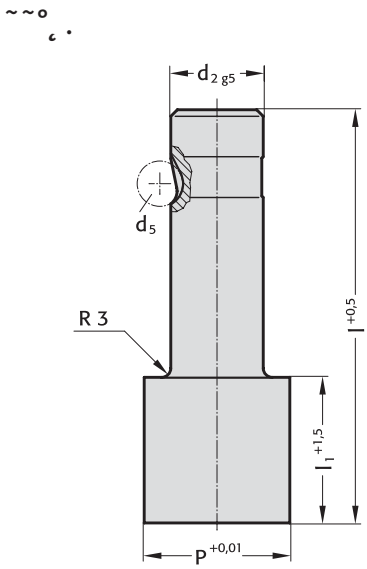
Material:

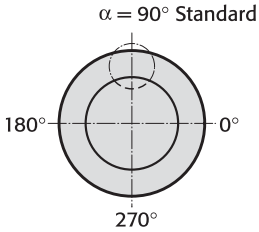
HSS
Hardness 62 ± 2 HRC

Execution:

Shaft and punch diameter fine ground.
Special dimensions on request.

Ball lock punch, punch larger than shaft, round, light duty





2214. Ball lock punch, punch larger than shaft, round, light duty

d_2 / (Order No)	d_5	P	l_1 / (Order No)	l / (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	8	13 - 32	19 (2) 30 (4)		●	●	●
16 / (4)	8	16 - 38	19 (2) 30 (4)		●	●	●
20 / (5)	8	20 - 40	19 (2) 30 (4)		●	●	●
25 / (6)	8	25 - 44	19 (2) 30 (4)		●	●	●
32 / (7)	8	32 - 50	19 (2) 30 (4)		●	●	●

Material:

HSS
Hardness 62 ± 2 HRC

Execution:

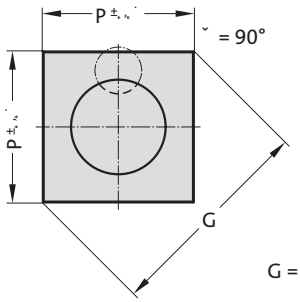
Shaft and punch diameter fine ground.
Special dimensions on request.

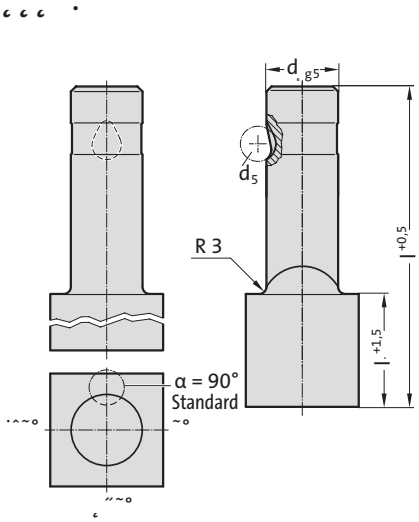
Ordering-code (example):

2 2 1 4 . 7 G 2 . 3 8 0 0

Format: Round	
P = Ø 38,0 mm	= 3800
Punch cutting length: l_1	**Order No**
19 mm	= (2)
length: l	**Order code character**
100 mm	= (G)
diameter: d_2	**Order No**
32 mm	= (7)
Type:	**Order No**
punch larger, light duty	= (4)
Version:	**Order No**
Round	= (1)
Punch:	
without ejector pin	= 22

Ball lock punch, punch larger than shaft, square, light duty





2224. Ball lock punch, punch larger than shaft, square, light duty

d_2 / (Order No)	d_5	P_{min}	G_{max}	l_1 / (Order No)	l / (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	8	9.19	32	19 (2) 30 (4)		●	●	●
16 / (4)	8	11.31	38	19 (2) 30 (4)		●	●	●
20 / (5)	8	14.14	40	19 (2) 30 (4)		●	●	●
25 / (6)	8	17.68	44	19 (2) 30 (4)		●	●	●
32 / (7)	8	22.63	50	19 (2) 30 (4)		●	●	●

Ordering-code (example):

2 2 2 4 . 7 F 2 . 3 5 3 5 A

Angle:	0°	**Order code character** = (A)
Format: Square, length P	P = 35,35 mm	= 3535
Punch cutting length: l_1	19 mm	**Order No** = (2)
Length: l	90 mm	**Order code character** = (F)
Diameter: d_2	32 mm	**Order No** = (7)
Type:	punch larger, light duty	**Order No** = (4)
Version:	Square	**Order No** = (2)
Punch:	without ejector pin	= 22

Material:

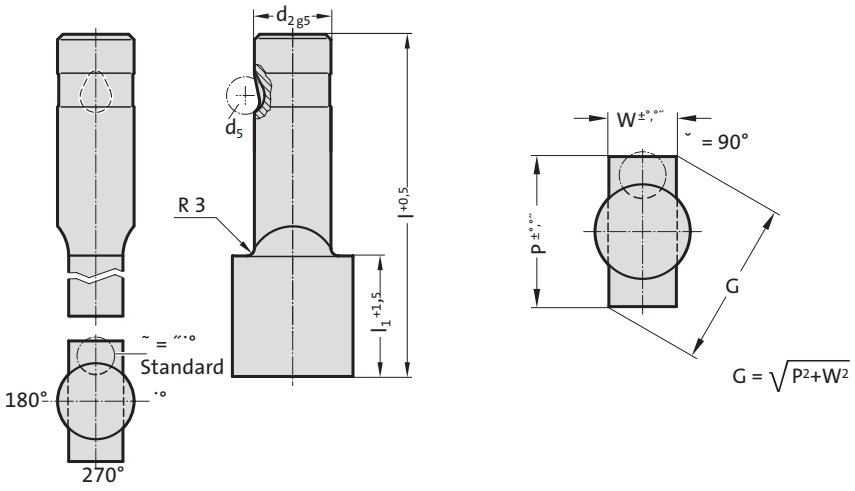
HSS
Hardness 62 ± 2 HRC

Execution:

Shaft and punch shape fine ground.
Special dimensions on request.

Ball lock punch, punch larger than shaft, rectangular, light duty

2234.



2234. Ball lock punch, punch larger than shaft, rectangular, light duty

d_2 / (Order No)	d_5	W_{min}	G_{max}	l_1 / (Order No)	l / (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	8	5	32	19 (2) 30 (4)		●	●	●
16 / (4)	8	6.5	38	19 (2) 30 (4)		●	●	●
20 / (5)	8	8	40	19 (2) 30 (4)		●	●	●
25 / (6)	8	10	44	19 (2) 30 (4)		●	●	●
32 / (7)	8	11.5	50	19 (2) 30 (4)		●	●	●

CAD

Material:

HSS
Hardness 62 ± 2 HRC

Execution:

Shaft and punch shape fine ground.
Special dimensions on request.

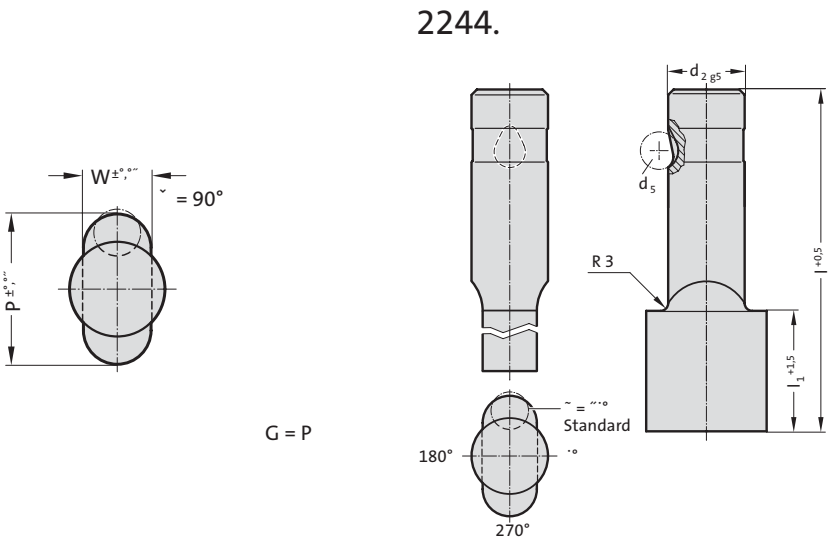
Ordering-code (example):

2 2 3 4 . 7 F 2 . 3 8 0 0 . 1 1 5 0 B

Angle:	**Order code character**
90°	= (B)
Format: Rectangular, width W	
W = 11,5 mm	= 1150
Format: Rectangular, length P	
P = 38 mm	= 3800
Punch cutting length: l_1	**Order No**
19 mm	= (2)
Length: l	**Order code character**
90 mm	= (F)
Diameter: d_2	**Order No**
32 mm	= (7)
Type:	**Order No**
punch larger, light duty	= (4)
Version:	**Order No**
Rectangular	= (3)
Punch:	
without ejector pin	= 22

Ball lock punch, punch larger than shaft, slot, light duty

2244.



2244. Ball lock punch, punch larger than shaft, slot, light duty

d_2 / (Order No)	d_5	W_{min}	G_{max}	l_1 / (Order No)	l / (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	8	5	32	19 (2) 30 (4)		●	●	●
16 / (4)	8	6.5	38	19 (2) 30 (4)		●	●	●
20 / (5)	8	8	40	19 (2) 30 (4)		●	●	●
25 / (6)	8	10	44	19 (2) 30 (4)		●	●	●
32 / (7)	8	11.5	50	19 (2) 30 (4)		●	●	●

Ordering-code (example):

2 2 4 4 . 4 F 2 . 3 8 0 0 . 0 6 5 0 B

	Angle	**Order code character**
	90°	= (B)
	Format: Slot, width W	
	W = 6,5 mm	= 0650
	Format: Slot, length P	
	P = 38,0 mm	= 3800
	Punch cutting length: l_1	**Order No**
	19 mm	= (2)
	Length: l	**Order code character**
	90 mm	= (F)
	Diameter: d_2	**Order No**
	16 mm	= (4)
	Type:	**Order No**
	punch larger, light duty	= (4)
	Version:	**Order No**
	Slot	= (4)
	Punch:	
	without ejector pin	= 22

Material:

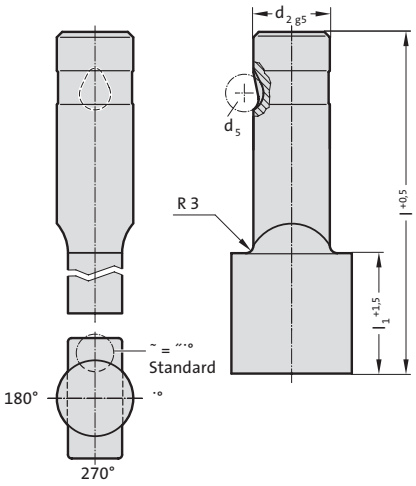
HSS
Hardness 62 ± 2 HRC

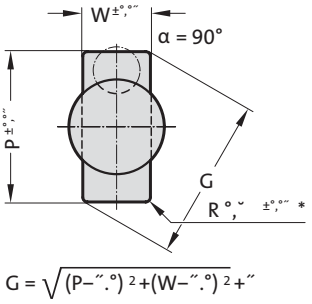
Execution:

Shaft and punch shape fine ground.
Special dimensions on request.

Ball lock punch, punch larger than shaft, rectangle with radiussed corners, light duty

2254.





2254. Ball lock punch, punch larger than shaft, rectangle with radiussed corners, light duty

d_2 / (Order No)	d_5	W_{min}	G_{max}	l_1 / (Order No)	l / (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	8	5	32	19 (2) 30 (4)		●	●	●
16 / (4)	8	6.5	38	19 (2) 30 (4)		●	●	●
20 / (5)	8	8	40	19 (2) 30 (4)		●	●	●
25 / (6)	8	10	44	19 (2) 30 (4)		●	●	●
32 / (7)	8	11.5	50	19 (2) 30 (4)		●	●	●

CAD

Material:

HSS
Hardness 62 ± 2 HRC

Execution:

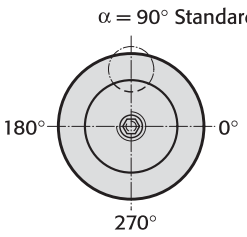
Shaft and punch shape fine ground.
Special dimensions on request.
* For other radius options, see standardised special shapes.

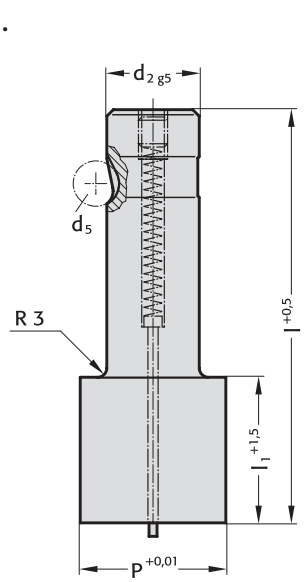
Ordering-code (example):

2 2 5 4 . 7 F 2 . 3 8 0 0 . 1 1 5 0 B

Angle:	**Order code character**
90°	= (B)
Format: Rectangle with radiused corners, width W	
W = 11,5 mm	= 1150
Format: Rectangle with radiused corners, length P	
P = 38,0 mm	= 3800
Punch cutting length: l_1	**Order No**
19 mm	= (2)
Length: l	**Order code character**
90 mm	= (F)
Diameter: d_2	**Order No**
32 mm	= (7)
Type:	**Order No**
punch larger, light duty	= (4)
Version:	**Order No**
Rectangle with radiused corners	= (5)
Punch:	
without ejector pin	= 22

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





2704. Ball lock punch, punch larger than shaft, blank, with ejector pin, light duty

d_2 / (Order No)	d_5	P	l_1 / (Order No)	l / (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	8	32	19 (2) 30 (4)		●	●	●
16 / (4)	8	38	19 (2) 30 (4)		●	●	●
20 / (5)	8	40	19 (2) 30 (4)		●	●	●
25 / (6)	8	44	19 (2) 30 (4)		●	●	●
32 / (7)	8	50	19 (2) 30 (4)		●	●	●

Ordering-code (example):

2 7 0 4 . 4 F 4 . 3 8 0 0

Format: Round	
P = ø38,0 mm	= 3800
Punch cutting length: l_1	**Order No**
30 mm	= (4)
length: l	**Order code character**
90 mm	= (F)
diameter: d_2	**Order No**
16 mm	= (4)
Type:	**Order No**
punch larger, light duty	= (4)
Version:	**Order No**
Blank	= (0)
Punch:	
with ejector pin	= 27

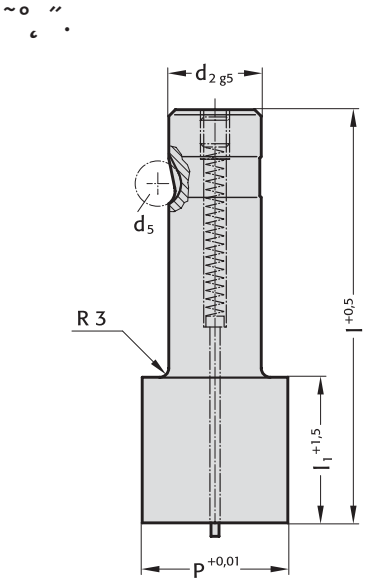
Material:

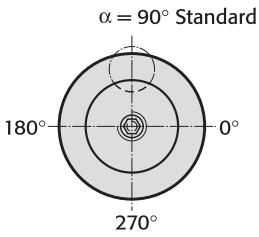
HSS
Hardness 62 ± 2 HRC

Execution:

Shaft and punch diameter fine ground.
Special dimensions on request.

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





2714. Ball lock punch, punch larger than shaft, round, with ejector pin, light duty

d_2 / (Order No)	d_5	P	l_1 / (Order No)	l / (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	8	13 - 32	19 (2) 30 (4)		●	●	●
16 / (4)	8	16 - 38	19 (2) 30 (4)		●	●	●
20 / (5)	8	20 - 40	19 (2) 30 (4)		●	●	●
25 / (6)	8	25 - 44	19 (2) 30 (4)		●	●	●
32 / (7)	8	32 - 50	19 (2) 30 (4)		●	●	●

CAD

Material:

HSS
Hardness 62 ± 2 HRC

Execution:

Shaft and punch diameter fine ground.
Special dimensions on request.

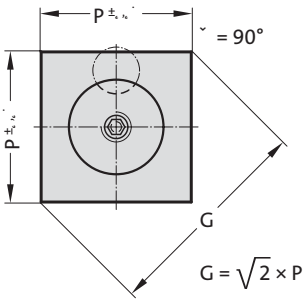
Ordering-code (example):

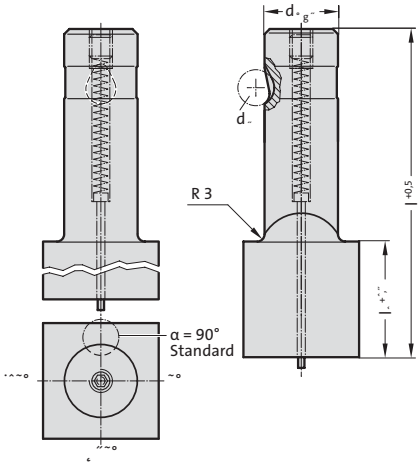
2 7 1 4 . 7 G 2 . 4 2 5 0

Format: Round	
P = Ø 42,5 mm	= 4250
Punch cutting length: l_1	**Order No**
19 mm	= (2)
length: l	**Order code character**
100 mm	= (G)
diameter: d_2	**Order No**
32 mm	= (7)
Type:	**Order No**
punch larger, light duty	= (4)
Version:	**Order No**
Round	= (1)
Punch:	
with ejector pin	= 27

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

2724.





2724. Ball lock punch, punch larger than shaft, square, with ejector pin, light duty

d_2 / (Order No)	d_5	P_{min}	G_{max}	l_1 / (Order No)	l / (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	8	9.19	32	19 (2) 30 (4)		●	●	●
16 / (4)	8	11.31	38	19 (2) 30 (4)		●	●	●
20 / (5)	8	14.14	40	19 (2) 30 (4)		●	●	●
25 / (6)	8	17.68	44	19 (2) 30 (4)		●	●	●
32 / (7)	8	22.63	50	19 (2) 30 (4)		●	●	●

CAD

Ordering-code (example):

2 7 2 4 . 5 E 2 . 2 8 2 8 A

Angle:	0°	**Order code character** = (A)
Format: Square, length P	P = 28,28 mm	= 2828
Punch cutting length: l_1	19 mm	**Order No** = (2)
Length: l	80 mm	**Order code character** = (E)
Diameter: d_2	20 mm	**Order No** = (5)
Type:	punch larger, light duty	**Order No** = (4)
Version:	Square	**Order No** = (2)
Punch:	with ejector pin	= 27

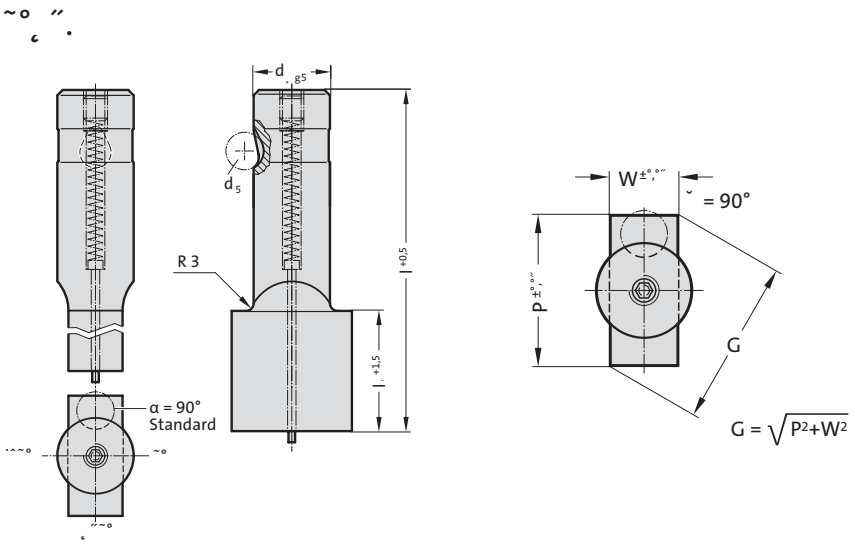
Material:

HSS
Hardness 62 ± 2 HRC

Execution:

Shaft and punch shape fine ground.
Special dimensions on request.

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



2734. Ball lock punch, punch larger than shaft, rectangular, with ejector pin, light duty

d_2 / (Order No)	d_5	W_{min}	G_{max}	l_1 / (Order No)	l / (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	8	5	32	19 (2) 30 (4)		●	●	●
16 / (4)	8	6.5	38	19 (2) 30 (4)		●	●	●
20 / (5)	8	8	40	19 (2) 30 (4)		●	●	●
25 / (6)	8	10	44	19 (2) 30 (4)		●	●	●
32 / (7)	8	11.5	50	19 (2) 30 (4)		●	●	●

CAD

Material:

HSS
Hardness 62 ± 2 HRC

Execution:

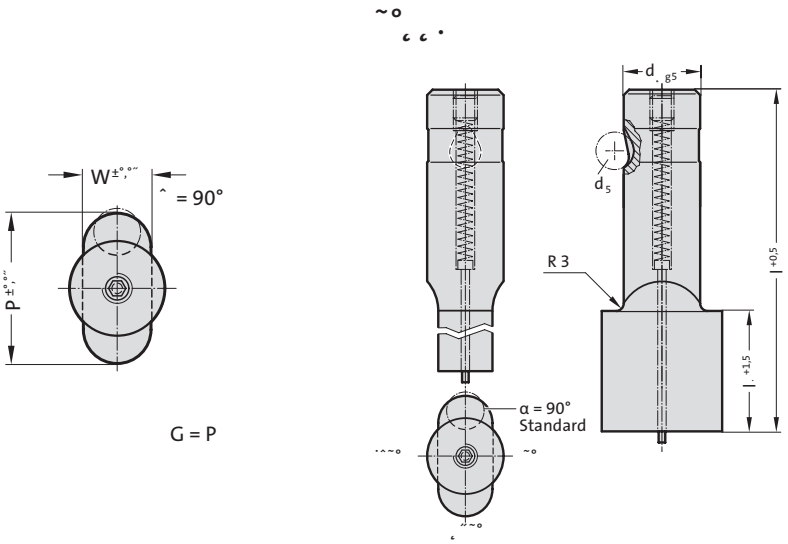
Shaft and punch shape fine ground.
Special dimensions on request.

Ordering-code (example):

2734.7F2.3800.1150B

Angle:	**Order code character**
90°	= (B)
Format: Rectangular, width W	
W = 11,5 mm	= 1150
Format: Rectangular, length P	
P = 38 mm	= 3800
Punch cutting length: l_1	**Order No**
19 mm	= (2)
Length: l	**Order code character**
90 mm	= (F)
Diameter: d_2	**Order No**
32 mm	= (7)
Type:	**Order No**
punch larger, light duty	= (4)
Version:	**Order No**
Rectangular	= (3)
Punch:	
with ejector pin	= 27

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



2744. Ball lock punch, punch larger than shaft, slot, with ejector pin, light duty

d_2 / (Order No)	d_5	W_{min}	G_{max}	l_1 / (Order No)	l / (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	8	5	32	19 (2) 30 (4)		●	●	●
16 / (4)	8	6.5	38	19 (2) 30 (4)		●	●	●
20 / (5)	8	8	40	19 (2) 30 (4)		●	●	●
25 / (6)	8	10	44	19 (2) 30 (4)		●	●	●
32 / (7)	8	11.5	50	19 (2) 30 (4)		●	●	●

Ordering-code (example):

2 7 4 4 . 7 F 2 . 3 8 0 0 . 1 1 5 0 B

	Angle	**Order code character**
	90°	= (B)
	Format: Slot, width W	
	W = 11,5 mm	= 1150
	Format: Slot, length P	
	P = 38,0 mm	= 3800
	Punch cutting length: l_1	**Order No**
	19 mm	= (2)
	Length: l	**Order code character**
	90 mm	= (F)
	Diameter: d_2	**Order No**
	32 mm	= (7)
	Type:	**Order No**
	punch larger, light duty	= (4)
	Version:	**Order No**
	Slot	= (4)
	Punch:	
	with ejector pin	= 27

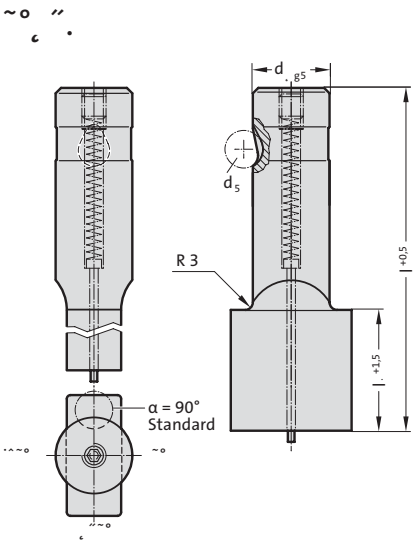
Material:

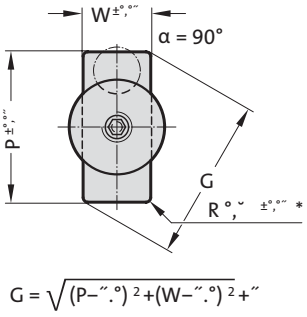
HSS
Hardness 62 ± 2 HRC

Execution:

Shaft and punch shape fine ground.
Special dimensions on request.

Ball lock punch, punch larger than shaft, rectangle with radiussed corners, with ejector pin, light duty





2754. Ball lock punch, punch larger than shaft, rectangle with radiussed corners, with ejector pin, light duty

d_2 / (Order No)	d_5	W_{min}	G_{max}	l_1 / (Order No)	l / (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	8	5	32	19 (2) 30 (4)		●	●	●
16 / (4)	8	6.5	38	19 (2) 30 (4)		●	●	●
20 / (5)	8	8	40	19 (2) 30 (4)		●	●	●
25 / (6)	8	10	44	19 (2) 30 (4)		●	●	●
32 / (7)	8	11.5	50	19 (2) 30 (4)		●	●	●

CAD

Material:

HSS
Hardness 62 ± 2 HRC

Execution:

Shaft and punch shape fine ground.
Special dimensions on request.
* For other radius options, see standardised special shapes.

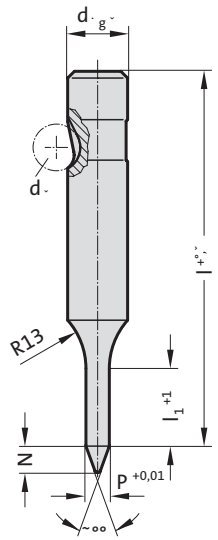
Ordering-code (example):

2754.7F2.3800.1150B

Angle:		**Order code character**
90°		= (B)
Format: Rectangle with radiused corners, width W		
W = 11,5 mm		= 1150
Format: Rectangle with radiused corners, length P		
P = 38,0 mm		= 3800
Punch cutting length: l_1		**Order No**
19 mm		= (2)
Length: l		**Order code character**
90 mm		= (F)
Diameter: d_2		**Order No**
32 mm		= (7)
Type:		**Order No**
punch larger, light duty		= (4)
Version:		**Order No**
Rectangle with radiused corners		= (5)
Punch:		
with ejector pin		= 27

Ball lock pilot pin, with tapered tip, light duty

2262.



2262. Ball lock pilot pin, with tapered tip, light duty

d_2 / (Order No)	d_5	P	l_1 / (Order No)	N	l / (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)	140 (K)	150 (I)
10 / (2)	8	5.9 - 9.9	19 (2)	8		●	●	●	●	●			
13 / (3)	8	9.9 - 12.9	19 (2)	10		●	●	●	●	●	●	●	
16 / (4)	8	12.9 - 15.9	25 (3)	15		●	●	●	●	●	●	●	●
20 / (5)	8	15.9 - 19.9	25 (3)	20		●	●	●	●	●	●	●	●
25 / (6)	8	19.9 - 24.9	25 (3)	25		●	●	●	●	●	●	●	●
32 / (7)	8	24.9 - 31.9	25 (3)	30			●	●	●	●	●	●	●
38 / (8)	8	31.9 - 37.9	30 (4)	35			●	●	●	●	●	●	●

Ordering-code (example):

2 2 6 2 . 4 G 3 . 1 4 0 0

Format: Round		
P = ∅ 14,0 mm		= 1400
Punch cutting length: l_1		**Order No**
25 mm		= (3)
Length: l		**Order code character**
100 mm		= (G)
Diameter: d_2		**Order No**
16 mm		= (4)
Type:		**Order No**
light		= (2)
Version:		**Order No**
Pilot pin with tapered tip		= (6)
Punch:		
without ejector pin		= 22

Material:

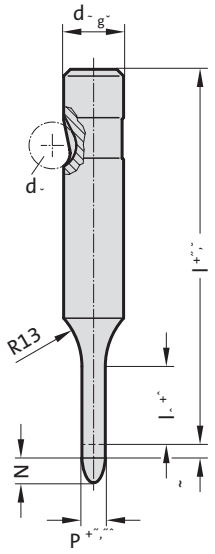
HSS
Hardness 62 ± 2 HRC

Execution:

Shaft and pilot pin fine ground.
Special dimensions on request.

Ball lock pilot pin, with parabolic tip, light duty

2272.



2272. Ball lock pilot pin, with parabolic tip, light duty

d_2 / (Order No)	d_5	P	l_1 / (Order No)	l / (Order Code character)	50 (A)	56 (B)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 / (1)	6	2,9-5,9	13 (1)		●	●	●	●	●	●	●
10 / (2)	8	5,9-9,9	19 (2)		●	●	●	●	●	●	●
13 / (3)	8	9,9-12,9	19 (2)		●	●	●	●	●	●	●
16 / (4)	8	12,9-15,9	25 (3)				●	●	●	●	●
20 / (5)	8	15,9-19,9	25 (3)				●	●	●	●	●
25 / (6)	8	19,9-24,9	25 (3)				●	●	●	●	●
32 / (7)	8	24,9-31,9	25 (3)					●	●	●	●
38 / (8)	8	31,9-37,9	30 (4)						●	●	●

Material:

HSS
Hardness 62 ± 2 HRC

Execution:

Shaft and pilot pin fine ground.
Special dimensions on request.

Note:

The 2 mm length provides full guidance before the blanking punch contacts the sheet metal.

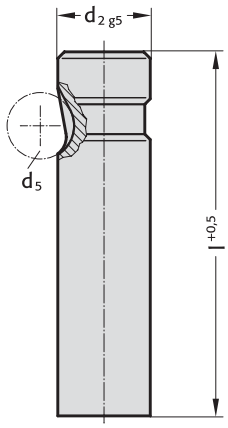
Length of parabolic tip N:
= 8 mm where P ≤ 10 mm
=12 mm where P 10,1 mm - 15 mm
=15 mm where P > 15 mm

Ordering-code (example):

2 2 7 2 . 4 G 3 . 1 4 0 0

Format: Round	
P = ∅ 14,0 mm	= 1400
Punch cutting length: l_1	**Order No**
25 mm	= (3)
Length: l	**Order code character**
100 mm	= (G)
Diameter: d_2	**Order No**
16 mm	= (4)
Type:	**Order No**
light	= (2)
Version:	**Order No**
Pilot pin with parabolic tip	= (7)
Punch:	
without ejector pin	= 22

Ball lock punch, blank, heavy duty



2203. Ball lock punch, blank, heavy duty

d_2 / (Order No)	d_5	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)	140 (K)	150 (I)	175 (M)	200 (N)
10 / (2)	10		●	●	●	●	●	●	●				
13 / (3)	12		●	●	●	●	●	●	●	●	●	●	
16 / (4)	12		●	●	●	●	●	●	●	●	●	●	
20 / (5)	12		●	●	●	●	●	●	●	●	●	●	
25 / (6)	12			●	●	●	●	●	●	●	●	●	●
32 / (7)	12			●	●	●	●	●	●	●	●	●	●
40 / (9)	12				●	●	●	●	●	●	●	●	●

Ordering code (example):

2 2 0 3 . 7 G

Length: l	100 mm	**Order Code character** = (G)
Diameter: d_2	32 mm	**Order No** = (7)
Type:	heavy duty	**Order No** = (3)
Version:	blank	**Order No** = (0)
Punch:	without ejector pin	= 22

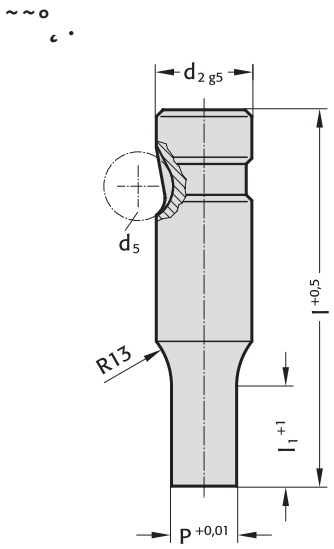
Material:

HSS
Hardness 62 ± 2 HRC

Execution:

Shaft fine ground.
Special dimensions on request.

Ball lock punch, stepped, round, heavy duty



2213. Ball lock punch, stepped, round, heavy duty

d_2 / (Order No)	d_5	P	l_1 / (Order No)*	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)
10 / (2)	10	1.6 - 9.9	13 (1) 19 (2)		●	●	●	●	●	●	●
13 / (3)	12	5 - 12.9	13 (1) 19 (2)		●	●	●	●	●	●	●
16 / (4)	12	8 - 15.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●	●	●
20 / (5)	12	12 - 19.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●	●	●
25 / (6)	12	16 - 24.9	13 (1) 19 (2) 25 (3)			●	●	●	●	●	●
32 / (7)	12	24 - 31.9	13 (1) 19 (2) 25 (3)			●	●	●	●	●	●
40 / (9)	12	30 - 39.9	19 (2) 25 (3) 30 (4)				●	●	●	●	●

*l_1=10 where P < 2.20

Material:

HSS
Hardness 62 ± 2 HRC

Execution:

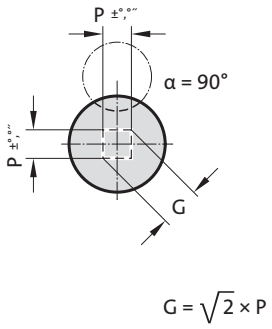
Shaft and punch diameter fine ground.
Special dimensions on request.

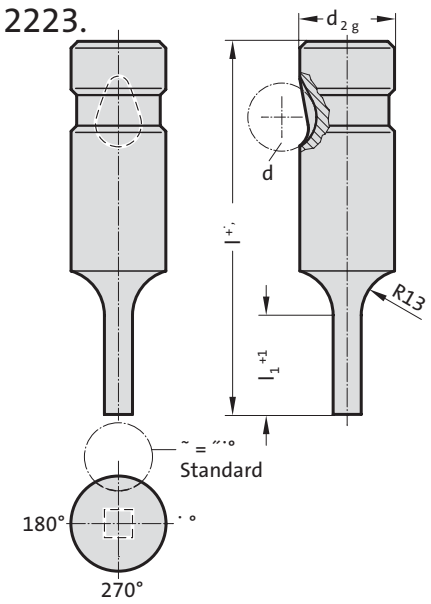
Ordering-code (example):

2213.7G2.2450

Format: Round
P = ø24,5 mm = 2450
Punch cutting length: l_1 **Order No**
19 mm = (2)
length: l **Order code character**
100 mm = (G)
diameter: d_2 **Order No**
32 mm = (7)
Type: **Order No**
heavy duty = (3)
Version: **Order No**
Round = (1)
Punch:
without ejector pin = 22

Ball lock punch, stepped, square, heavy duty





2223. Ball lock punch, stepped, square, heavy duty

d_2 / (Order No)	d_5	P_{min}	G_{max}	l_1 / (Order No)*	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)
10 / (2)	10	1.6	9.9	13 (1) 19 (2)		●	●	●	●	●	●	●
13 / (3)	12	4.5	12.9	13 (1) 19 (2)		●	●	●	●	●	●	●
16 / (4)	12	6	15.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●	●	●
20 / (5)	12	8	19.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●	●	●
25 / (6)	12	10	24.9	13 (1) 19 (2) 25 (3)			●	●	●	●	●	●
32 / (7)	12	12.5	31.9	13 (1) 19 (2) 25 (3)			●	●	●	●	●	●
40 / (9)	12	14	39.9	19 (2) 25 (3) 30 (4)				●	●	●	●	●

*l_1=10 where P < 2.20

Ordering-code (example):

2 2 2 3 . 3 F 1 . 0 6 0 0 B

Angle:	90°	**Order code character** = (B)
Format: Square, length P		
P = 6,0 mm		= 0600
Punch cutting length: l_1		**Order No**
13 mm		= (1)
Length: l		**Order code character**
90 mm		= (F)
Diameter: d_2		**Order No**
13 mm		= (3)
Type:		**Order No**
heavy duty		= (3)
Version:		**Order No**
Square		= (2)
Punch:		
without ejector pin		= 22

Material:

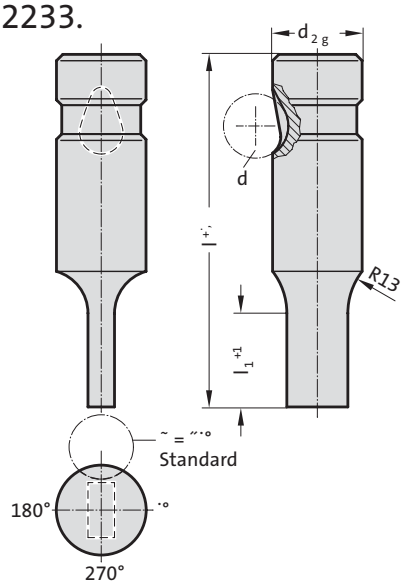
HSS
Hardness 62 ± 2 HRC

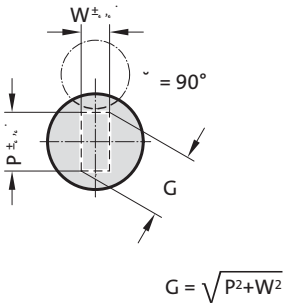
Execution:

Shaft and punch shape fine ground.
Special dimensions on request.

Ball lock punch, stepped, rectangular, heavy duty

2233.





2233. Ball lock punch, stepped, rectangular, heavy duty

d_2 / (Order No)	d_5	W_{min}	G_{max}	l_1 / (Order No)*	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)
10 / (2)	10	1.6	9.9	13 (1) 19 (2)		●	●	●	●	●	●	●
13 / (3)	12	4.5	12.9	13 (1) 19 (2)		●	●	●	●	●	●	●
16 / (4)	12	6	15.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●	●	●
20 / (5)	12	8	19.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●	●	●
25 / (6)	12	10	24.9	13 (1) 19 (2) 25 (3)			●	●	●	●	●	●
32 / (7)	12	12.5	31.9	13 (1) 19 (2) 25 (3)			●	●	●	●	●	●
40 / (9)	12	14	39.9	19 (2) 25 (3) 30 (4)				●	●	●	●	●

*l_1=10 where W < 2.20

Material:

HSS
Hardness 62 ± 2 HRC

Execution:

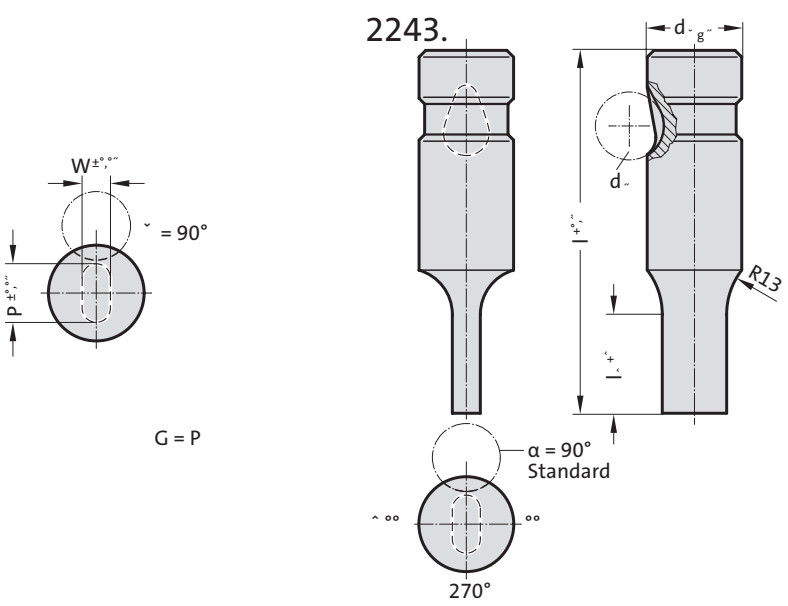
Shaft and punch shape fine ground.
Special dimensions on request.

Ordering-code (example):

2 2 3 3 . 2 F 1 . 0 6 5 0 . 0 4 5 0 B

Angle:	**Order code character**
90°	= (B)
Format: Rectangular, width W	
W = 4,5 mm	= 0450
Format: Rectangular, length P	
P = 6,5 mm	= 0650
Punch cutting length: l_1	**Order No**
13 mm	= (1)
Length: l	**Order code character**
90 mm	= (F)
Diameter: d_2	**Order No**
10 mm	= (2)
Type:	**Order No**
heavy duty	= (3)
Version:	**Order No**
Rectangular	= (3)
Punch:	
without ejector pin	= 22

Ball lock punch, stepped, slot, heavy duty



2243. Ball lock punch, stepped, slot, heavy duty

d_2 / (Order No)	W_{min}	G_{max}	l_1 / (Order No)*	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)
10 / (2)	1.6	9.9	13 (1) 19 (2)		●	●	●	●	●	●	●
13 / (3)	4.5	12.9	13 (1) 19 (2)		●	●	●	●	●	●	●
16 / (4)	6	15.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●	●	●
20 / (5)	8	19.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●	●	●
25 / (6)	10	24.9	13 (1) 19 (2) 25 (3)			●	●	●	●	●	●
32 / (7)	12.5	31.9	13 (1) 19 (2) 25 (3)			●	●	●	●	●	●
40 / (9)	14	39.9	19 (2) 25 (3) 30 (4)				●	●	●	●	●

*l_1=10 where W < 2.20

Ordering-code (example):

2 2 4 3 . 3 E 2 . 1 2 1 5 . 0 9 1 5 B

	Angle	**Order code character**
90°		= (B)
	Format: Slot, width W	
W = 9,15 mm		= 0915
	Format: Slot, length P	
P = 12,15 mm		= 1215
	Punch cutting length: l_1	**Order No**
19 mm		= (2)
	Length: l	**Order code character**
80 mm		= (E)
	Diameter: d_2	**Order No**
13 mm		= (3)
	Type:	**Order No**
heavy duty		= (3)
	Version:	**Order No**
Slot		= (4)
	Punch:	
without ejector pin		= 22

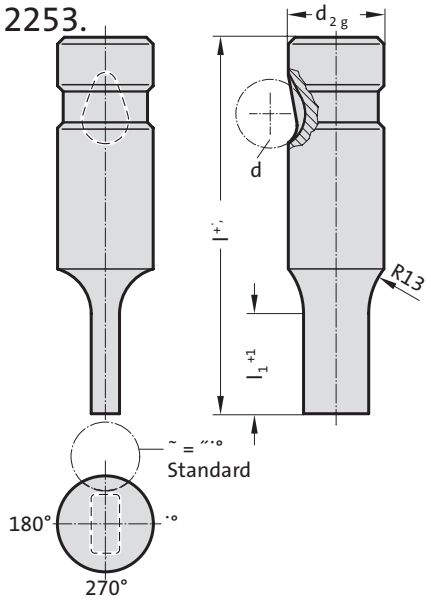
Material:

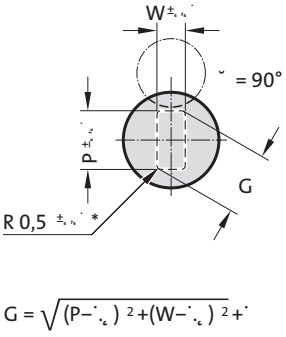
HSS
Hardness 62 ± 2 HRC

Execution:

Shaft and punch shape fine ground.
Special dimensions on request.

Ball lock punch, stepped, rectangle with radiussed corners, heavy duty





2253. Ball lock punch, stepped, rectangle with radiussed corners, heavy duty

d_2 / (Order No)	W_{min}	G_{max}	l_1 / (Order No)*	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)
10 / (2)	1.6	9.9	13 (1) 19 (2)		●	●	●	●	●	●	●
13 / (3)	4.5	12.9	13 (1) 19 (2)		●	●	●	●	●	●	●
16 / (4)	6	15.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●	●	●
20 / (5)	8	19.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●	●	●
25 / (6)	10	24.9	13 (1) 19 (2) 25 (3)			●	●	●	●	●	●
32 / (7)	12.5	31.9	13 (1) 19 (2) 25 (3)			●	●	●	●	●	●
40 / (9)	14	39.9	19 (2) 25 (3) 30 (4)				●	●	●	●	●

*l_1=10 where W < 2.20

CAD

Material:

HSS
Hardness 62 ± 2 HRC

Execution:

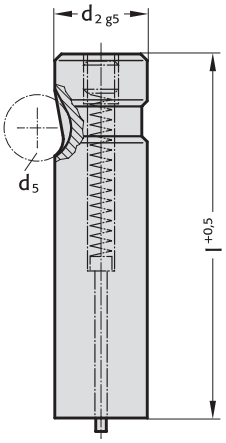
Shaft and punch shape fine ground.
Special dimensions on request.
* For other radius options, see standardised special shapes.

Ordering-code (example):

2 2 5 3 . 2 F 1 . 0 6 5 0 . 0 4 5 0 B

Angle:	**Order code character**
90°	= (B)
Format: Rectangle with radiused corners, width W	
W = 4,5 mm	= 0450
Format: Rectangle with radiused corners, length P	
P = 6,5 mm	= 0650
Punch cutting length: l_1	**Order No**
13 mm	= (1)
Length: l	**Order code character**
90 mm	= (F)
Diameter: d_2	**Order No**
10 mm	= (2)
Type:	**Order No**
heavy duty	= (3)
Version:	**Order No**
Rectangle with radiused corners	= (5)
Punch:	
without ejector pin	= 22

Ball lock punch, blank, with ejector pin, heavy duty



2703. Ball lock punch, blank, with ejector pin, heavy duty

d_2 / (Order No)	d_5	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)
10 / (2)	10		●	●	●	●	●		
13 / (3)	12		●	●	●	●	●	●	●
16 / (4)	12		●	●	●	●	●	●	●
20 / (5)	12		●	●	●	●	●	●	●
25 / (6)	12			●	●	●	●	●	●
32 / (7)	12			●	●	●	●	●	●
40 / (9)	12				●	●	●	●	●

Ordering-code (example):

2 7 0 3 . 7 G

Length: l	100 mm	**Order code character** = (G)
Diameter: d_2	32 mm	**Order No** = (7)
Type:	heavy duty	**Order No** = (3)
Version:	blank	**Order No** = (0)
Punch:	with ejector pin	= 27

Material:

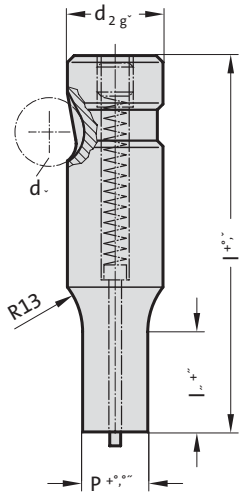
HSS
Hardness 62 ± 2 HRC

Execution:

Shaft fine ground.
Special dimensions on request.

Ball lock punch, stepped, round, with ejector pin, heavy duty

2713.



2713. Ball lock punch, stepped, round, with ejector pin, heavy duty

d_2 / (Order No)	d_5	P	l_1 / (Order No)*	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)
10 / (2)	10	1.6 - 9.9	13 (1) 19 (2)		●	●	●	●	●		
13 / (3)	12	5 - 12.9	13 (1) 19 (2)		●	●	●	●	●	●	●
16 / (4)	12	8 - 15.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●	●	●
20 / (5)	12	12 - 19.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●	●	●
25 / (6)	12	16 - 24.9	13 (1) 19 (2) 25 (3)			●	●	●	●	●	●
32 / (7)	12	24 - 31.9	13 (1) 19 (2) 25 (3)			●	●	●	●	●	●
40 / (9)	12	30 - 39.9	19 (2) 25 (3) 30 (4)				●	●	●	●	●

*l_1=10 where P < 2.20

CAD

Material:

HSS
Hardness 62 ± 2 HRC

Execution:

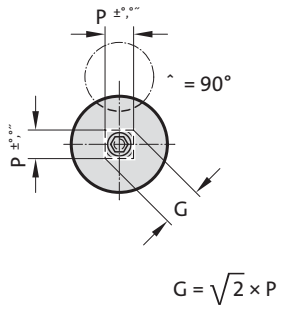
Shaft and punch diameter fine ground.
Special dimensions on request.

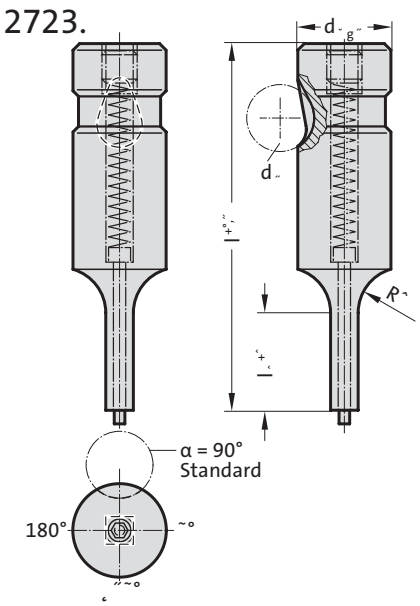
Ordering-code (example):

2713.3C1.0550

Format: Round	
P = Ø 5,5 mm	= 0550
Punch cutting length: l_1	**Order No**
13 mm	= (1)
length: l	**Order code character**
63 mm	= (C)
diameter: d_2	**Order No**
13 mm	= (3)
Type:	**Order No**
heavy duty	= (3)
Version:	**Order No**
Round	= (1)
Punch:	
with ejector pin	= 27

Ball lock punch, stepped, square, with ejector pin, heavy duty





2723. Ball lock punch, stepped, square, with ejector pin, heavy duty

d_2 / (Order No)	d_5	P_{min}	G_{max}	l_1 / (Order No)*	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)
10 / (2)	10	1.6	9.9	13 (1) 19 (2)		●	●	●	●	●		
13 / (3)	12	4.5	12.9	13 (1) 19 (2)		●	●	●	●	●	●	●
16 / (4)	12	6	15.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●	●	●
20 / (5)	12	8	19.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●	●	●
25 / (6)	12	10	24.9	13 (1) 19 (2) 25 (3)			●	●	●	●	●	●
32 / (7)	12	12.5	31.9	13 (1) 19 (2) 25 (3)			●	●	●	●	●	●
40 / (9)	12	14	39.9	19 (2) 25 (3) 30 (4)				●	●	●	●	●

*l_1=10 where P < 2.20

Ordering-code (example):

2 7 2 3 . 2 F 1 . 0 6 5 0 B

Angle:	90°	**Order code character** = (B)
Format: Square, length P	P = 6,5 mm	= 0650
Punch cutting length: l_1	13 mm	**Order No** = (1)
Length: l	90 mm	**Order code character** = (F)
Diameter: d_2	10 mm	**Order No** = (2)
Type:	heavy duty	**Order No** = (3)
Version:	Square	**Order No** = (2)
Punch:	with ejector pin	= 27

Material:

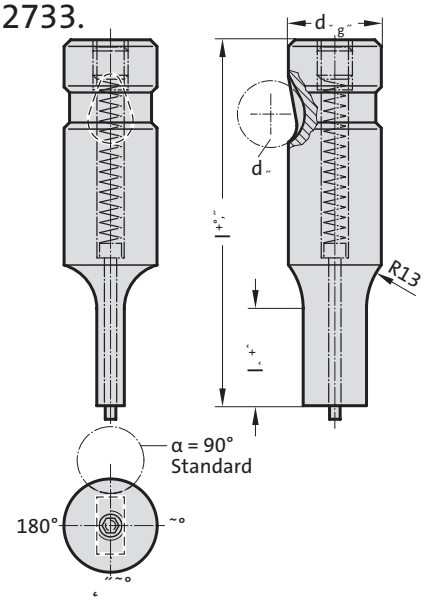
HSS
Hardness 62 ± 2 HRC

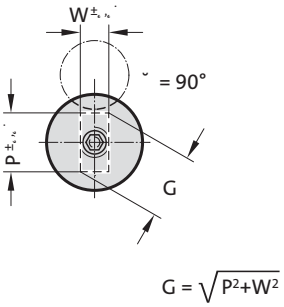
Execution:

Shaft and punch shape fine ground.
Special dimensions on request.

Ball lock punch, stepped, rectangular, with ejector pin, heavy duty

2733.





2733. Ball lock punch, stepped, rectangular, with ejector pin, heavy duty

d_2 / (Order No)	d_5	W_{min}	G_{max}	l_1 / (Order No)*	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)
10 / (2)	10	1.6	9.9	13 (1) 19 (2)		●	●	●	●	●	●	●
13 / (3)	12	4.5	12.9	13 (1) 19 (2)		●	●	●	●	●	●	●
16 / (4)	12	6	15.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●	●	●
20 / (5)	12	8	19.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●	●	●
25 / (6)	12	10	24.9	13 (1) 19 (2) 25 (3)			●	●	●	●	●	●
32 / (7)	12	12.5	31.9	13 (1) 19 (2) 25 (3)			●	●	●	●	●	●
40 / (9)	12	14	39.9	19 (2) 25 (3) 30 (4)				●	●	●	●	●

*l_1=10 where W < 2.20

CAD

Material:

HSS
Hardness 62 ± 2 HRC

Execution:

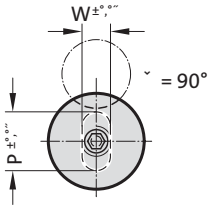
Shaft and punch shape fine ground.
Special dimensions on request.

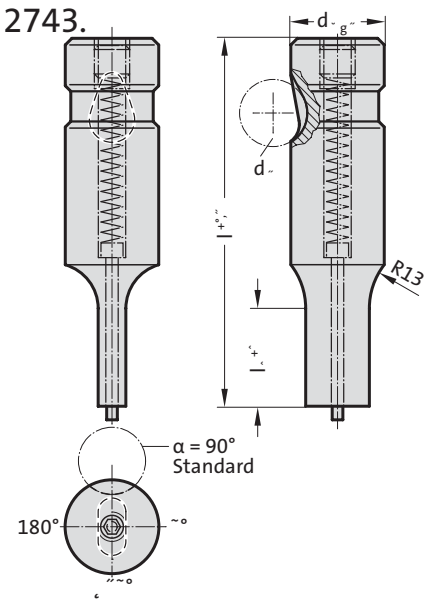
Ordering-code (example):

2733.7F2.1400.1250B

Angle:	90°	**Order code character** = (B)
Format: Rectangular, width W	W = 12,5 mm	= 1250
Format: Rectangular, length P	P = 14,0 mm	= 1400
Punch cutting length: l_1	19 mm	**Order No** = (2)
Length: l	90 mm	**Order code character** = (F)
Diameter: d_2	32 mm	**Order No** = (7)
Type:	heavy duty	**Order No** = (3)
Version:	Rectangular	**Order No** = (3)
Punch:	with ejector pin	= 27

Ball lock punch, stepped, slot, with ejector pin, heavy duty





2743. Ball lock punch, stepped, slot, with ejector pin, heavy duty

d_2 / (Order No)	d_5	W_{min}	G_{max}	l_1 / (Order No)*	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)
10 / (2)	10	1.6	9.9	13 (1) 19 (2)		●	●	●	●	●		
13 / (3)	12	4.5	12.9	13 (1) 19 (2)		●	●	●	●	●	●	●
16 / (4)	12	6	15.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●	●	●
20 / (5)	12	8	19.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●	●	●
25 / (6)	12	10	24.9	13 (1) 19 (2) 25 (3)			●	●	●	●	●	●
32 / (7)	12	12.5	31.9	13 (1) 19 (2) 25 (3)			●	●	●	●	●	●
40 / (9)	12	14	39.9	19 (2) 25 (3) 30 (4)				●	●	●	●	●

*l_1=10 where W < 2.20

Ordering-code (example):

2 7 4 3 . 2 F 1 . 0 6 5 0 . 0 4 5 0 B

Angle		**Order code character**
90°		= (B)
Format: Slot, width W		
W = 4,5 mm		= 0450
Format: Slot, length P		
P = 6,5 mm		= 0650
Punch cutting length: l_1		**Order No**
13 mm		= (1)
Length: l		**Order code character**
90 mm		= (F)
Diameter: d_2		**Order No**
10 mm		= (2)
Type:		**Order No**
heavy duty		= (3)
Version:		**Order No**
Slot		= (4)
Punch:		
with ejector pin		= 27

Material:

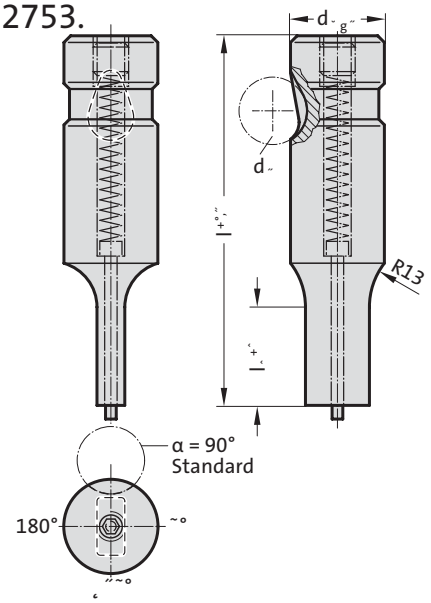
HSS
Hardness 62 ± 2 HRC

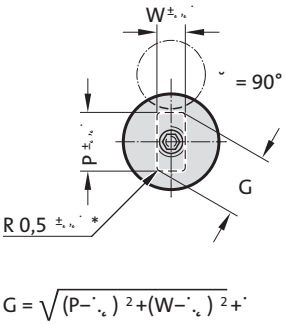
Execution:

Shaft and punch shape fine ground.
Special dimensions on request.

Ball lock punch, stepped, rectangle with radiussed corners, with ejector pin, heavy duty

2753.





2753. Ball lock punch, stepped, rectangle with radiussed corners, with ejector pin, heavy duty

d_2 / (Order No)	d_5	W_{min}	G_{max}	l_1 / (Order No)*	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)
10 / (2)	10	1.6	9.9	13 (1) 19 (2)		●	●	●	●	●		
13 / (3)	12	4.5	12.9	13 (1) 19 (2)		●	●	●	●	●	●	●
16 / (4)	12	6	15.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●	●	●
20 / (5)	12	8	19.9	13 (1) 19 (2) 25 (3)		●	●	●	●	●	●	●
25 / (6)	12	10	24.9	13 (1) 19 (2) 25 (3)			●	●	●	●	●	●
32 / (7)	12	12.5	31.9	13 (1) 19 (2) 25 (3)			●	●	●	●	●	●
40 / (9)	12	14	39.9	19 (2) 25 (3) 30 (4)				●	●	●	●	●

*l_1=10 where W < 2.20

CAD

Material:

HSS
Hardness 62 ± 2 HRC

Execution:

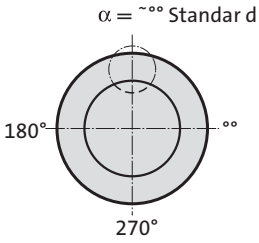
Shaft and punch shape fine ground.
Special dimensions on request.
* For other radius options, see standardised special shapes.

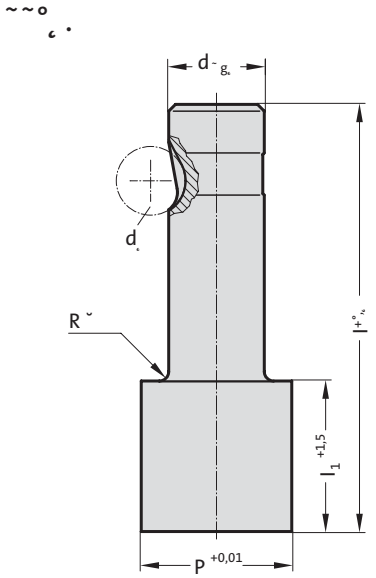
Ordering-code (example):

2753.3F1.1215.0915B

Angle:		**Order code character**
90°		= (B)
Format: Rectangle with radiused corners, width W		
W = 9,15 mm		= 0915
Format: Rectangle with radiused corners, length P		
P = 12,15 mm		= 1215
Punch cutting length: l_1		**Order No**
13 mm		= (1)
Length: l		**Order code character**
90 mm		= (F)
Diameter: d_2		**Order No**
13 mm		= (3)
Type:		**Order No**
heavy duty		= (3)
Version:		**Order No**
Rectangle with radiused corners		= (5)
Punch:		
with ejector pin		= 27

Ball lock punch, punch larger than shaft, blank, heavy duty





2205. Ball lock punch, punch larger than shaft, blank, heavy duty

d_2 / (Order No)	d_5	P	l_1 / (Order No)	l / (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	12	32	19 (2) 30 (4)		●	●	●
16 / (4)	12	38	19 (2) 30 (4)		●	●	●
20 / (5)	12	40	19 (2) 30 (4)		●	●	●
25 / (6)	12	44	19 (2) 30 (4)		●	●	●
32 / (7)	12	50	19 (2) 30 (4)		●	●	●
40 / (9)	12	56	19 (2) 30 (4)		●	●	●

Ordering-code (example):

2 2 0 5 . 7 G 4 . 5 0 0 0

Format: Round	
P = ∅ 50,0 mm	= 5000
Punch cutting length: l_1	**Order No**
30 mm	= (4)
length: l	**Order code character**
100 mm	= (G)
diameter: d_2	**Order No**
32 mm	= (7)
Type:	**Order No**
punch larger, heavy duty	= (5)
Version:	**Order No**
Blank	= (0)
Punch:	
without ejector pin	= 22

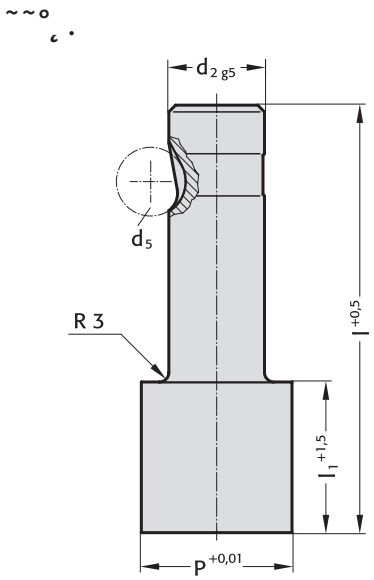
Material:

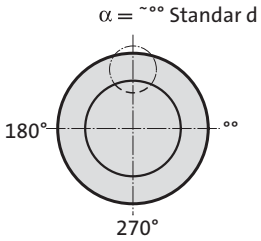
HSS
Hardness 62 ± 2 HRC

Execution:

Shaft and punch diameter fine ground.
Special dimensions on request.

Ball lock punch, punch larger than shaft, round, heavy duty





2215. Ball lock punch, punch larger than shaft, round, heavy duty

d_2 / (Order No)	d_5	P	l_1 / (Order No)	l / (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	12	13 - 32	19 (2) 30 (4)		●	●	●
16 / (4)	12	16 - 38	19 (2) 30 (4)		●	●	●
20 / (5)	12	20 - 40	19 (2) 30 (4)		●	●	●
25 / (6)	12	25 - 44	19 (2) 30 (4)		●	●	●
32 / (7)	12	32 - 50	19 (2) 30 (4)		●	●	●
40 / (9)	12	40 - 56	19 (2) 30 (4)		●	●	●

Material:

HSS
Hardness 62 ± 2 HRC

Execution:

Shaft and punch diameter fine ground.
Special dimensions on request.

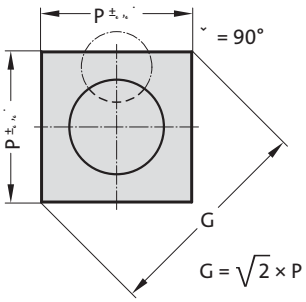
Ordering-code (example):

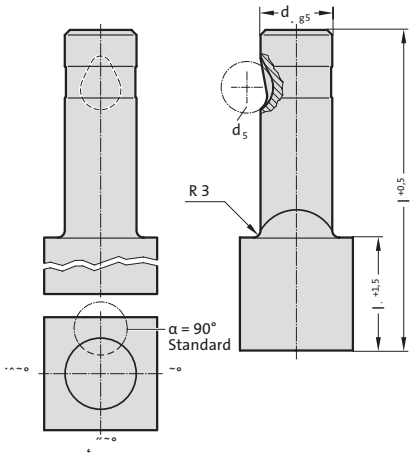
2 2 1 5 . 7 G 2 . 3 2 1 0

Format: Round	
P = ∅ 32,1 mm	= 3210
Punch cutting length: l_1	**Order No**
19 mm	= (2)
length: l	**Order code character**
100 mm	= (G)
diameter: d_2	**Order No**
32 mm	= (7)
Type:	**Order No**
punch larger, heavy duty	= (5)
Version:	**Order No**
Round	= (1)
Punch:	
without ejector pin	= 22

Ball lock punch, punch larger than shaft, square, heavy duty

2225.





2225. Ball lock punch, punch larger than shaft, square, heavy duty

d_2 / (Order No)	d_5	P_{min}	G_{max}	l_1 / (Order No)	l / (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	12	9.19	32	19 (2) 30 (4)		●	●	●
16 / (4)	12	11.31	38	19 (2) 30 (4)		●	●	●
20 / (5)	12	14.14	40	19 (2) 30 (4)		●	●	●
25 / (6)	12	17.68	44	19 (2) 30 (4)		●	●	●
32 / (7)	12	22.63	50	19 (2) 30 (4)		●	●	●
40 / (9)	12	28.28	56	19 (2) 30 (4)		●	●	●

Ordering-code (example):

2 2 2 5 . 4 F 4 . 1 1 5 0 B

Angle:	90°	**Order code character** = (B)
Format: Square, length P	P = 11,5 mm	= 1150
Punch cutting length: l_1	30 mm	**Order No** = (4)
Length: l	90 mm	**Order code character** = (F)
Diameter: d_2	16 mm	**Order No** = (4)
Type:	punch larger, heavy duty	**Order No** = (5)
Version:	Square	**Order No** = (2)
Punch:	without ejector pin	= 22

Material:

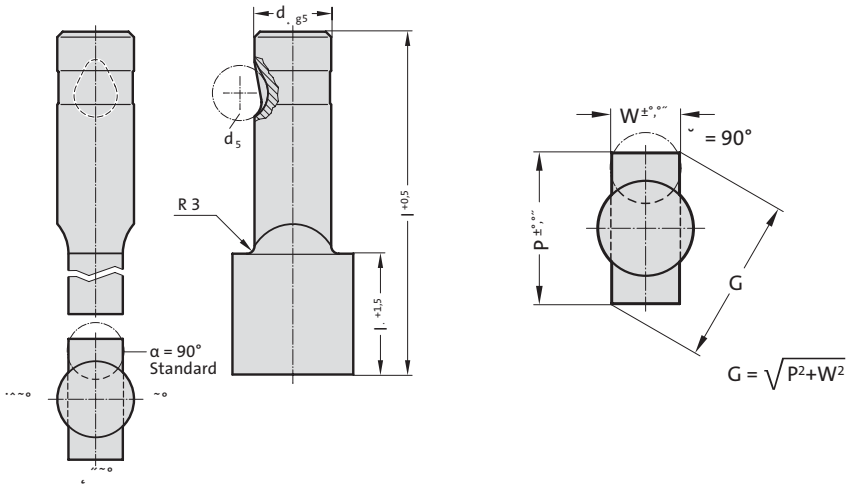
HSS
Hardness 62 ± 2 HRC

Execution:

Shaft and punch shape fine ground.
Special dimensions on request.

Ball lock punch, punch larger than shaft, rectangular, heavy duty

2235.



2235. Ball lock punch, punch larger than shaft, rectangular, heavy duty

d_2 / (Order No)	d_5	W_{min}	G_{max}	l_1 / (Order No)	l / (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	12	5	32	19 (2) 30 (4)		●	●	●
16 / (4)	12	6.5	38	19 (2) 30 (4)		●	●	●
20 / (5)	12	8	40	19 (2) 30 (4)		●	●	●
25 / (6)	12	10	44	19 (2) 30 (4)		●	●	●
32 / (7)	12	11.5	50	19 (2) 30 (4)		●	●	●
40 / (9)	12	14	56	19 (2) 30 (4)		●	●	●

CAD

Material:

HSS
Hardness 62 ± 2 HRC

Execution:

Shaft and punch shape fine ground.
Special dimensions on request.

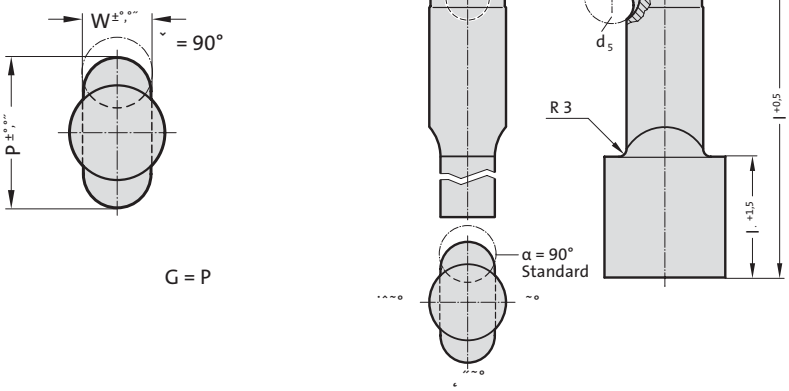
Ordering-code (example):

2 2 3 5 . 4 F 4 . 1 4 0 0 . 1 1 0 0 B

Angle:	**Order code character**
90°	= (B)
Format: Rectangular, width W	
W = 11,0 mm	= 1100
Format: Rectangular, length P	
P = 14 mm	= 1400
Punch cutting length: l_1	**Order No**
30 mm	= (4)
Length: l	**Order code character**
90 mm	= (F)
Diameter: d_2	**Order No**
16 mm	= (4)
Type:	**Order No**
punch larger, heavy duty	= (5)
Version:	**Order No**
Rectangular	= (3)
Punch:	
without ejector pin	= 22

Ball lock punch, punch larger than shaft, slot, heavy duty

2245.



2245. Ball lock punch, punch larger than shaft, slot, heavy duty

d_2 / (Order No)	d_5	W_{min}	G_{max}	l_1 / (Order No)	l / (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	12	5	32	19 (2) 30 (4)		●	●	●
16 / (4)	12	6.5	38	19 (2) 30 (4)		●	●	●
20 / (5)	12	8	40	19 (2) 30 (4)		●	●	●
25 / (6)	12	10	44	19 (2) 30 (4)		●	●	●
32 / (7)	12	11.5	50	19 (2) 30 (4)		●	●	●
40 / (9)	12	14	56	19 (2) 30 (4)		●	●	●

Ordering-code (example):

2 2 4 5 . 7 F 2 . 3 8 0 0 . 1 1 5 0 B

Angle	90°	**Order code character** = (B)
Format: Slot, width W	W = 11,5 mm	= 1150
Format: Slot, length P	P = 38,0 mm	= 3800
Punch cutting length: l_1	19 mm	**Order No** = (2)
Length: l	90 mm	**Order code character** = (F)
Diameter: d_2	32 mm	**Order No** = (7)
Type:	punch larger, heavy duty	**Order No** = (5)
Version:	Slot	**Order No** = (4)
Punch:	without ejector pin	= 22

Material:

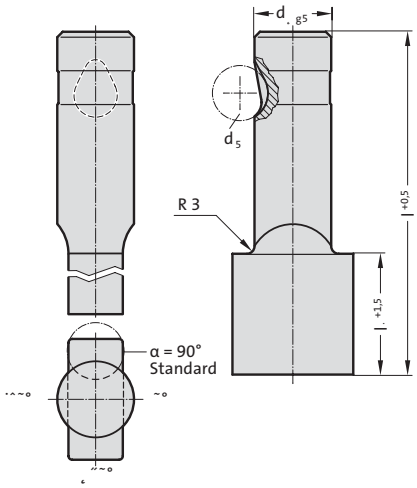
HSS
Hardness 62 ± 2 HRC

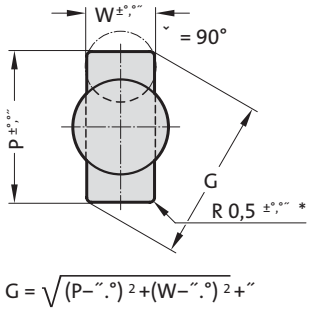
Execution:

Shaft and punch shape fine ground.
Special dimensions on request.

Ball lock punch, punch larger than shaft, rectangle with radiussed corners, heavy duty

2255.





2255. Ball lock punch, punch larger than shaft, rectangle with radiussed corners, heavy duty

d_2 / (Order No)	d_5	W_{min}	G_{max}	l_1 / (Order No)	l / (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	12	5	32	19 (2) 30 (4)		●	●	●
16 / (4)	12	6.5	38	19 (2) 30 (4)		●	●	●
20 / (5)	12	8	40	19 (2) 30 (4)		●	●	●
25 / (6)	12	10	44	19 (2) 30 (4)		●	●	●
32 / (7)	12	11.5	50	19 (2) 30 (4)		●	●	●
40 / (9)	12	14	56	19 (2) 30 (4)		●	●	●

CAD

Material:

HSS
Hardness 62 ± 2 HRC

Execution:

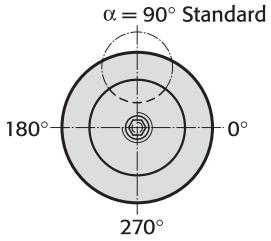
Shaft and punch shape fine ground.
Special dimensions on request.
* For other radius options, see standardised special shapes.

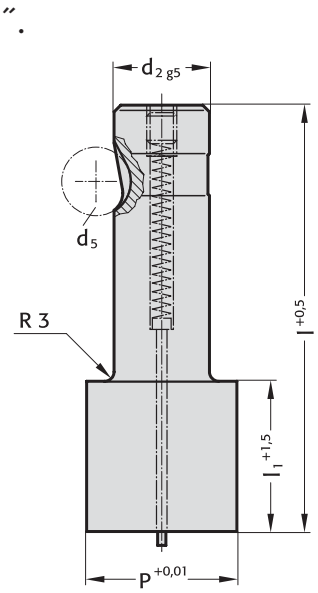
Ordering-code (example):

2 2 5 5 . 4 F 2 . 1 4 0 0 . 1 1 0 0 B

Angle:	**Order code character**
90°	= (B)
Format: Rectangle with radiused corners, width W	
W = 11,0 mm	= 1100
Format: Rectangle with radiused corners, length P	
P = 14,0 mm	= 1400
Punch cutting length: l_1	**Order No**
19 mm	= (2)
Length: l	**Order code character**
90 mm	= (F)
Diameter: d_2	**Order No**
16 mm	= (4)
Type:	**Order No**
punch larger, heavy duty	= (5)
Version:	**Order No**
Rectangle with radiused corners	= (5)
Punch:	
without ejector pin	= 22

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





2705. Ball lock punch, punch larger than shaft, blank, with ejector pin, heavy duty

d_2 / (Order No)	P	l_1 / (Order No)	l / (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	32	19 (2) 30 (4)		●	●	●
16 / (4)	38	19 (2) 30 (4)		●	●	●
20 / (5)	40	19 (2) 30 (4)		●	●	●
25 / (6)	44	19 (2) 30 (4)		●	●	●
32 / (7)	50	19 (2) 30 (4)		●	●	●
40 / (9)	56	19 (2) 30 (4)		●	●	●

Ordering-code (example):

2 7 0 5 . 7 G 4 . 5 0 0 0

Format: Round	
P = ∅ 50,0 mm	= 5000
Punch cutting length: l_1	**Order No**
30 mm	= (4)
length: l	**Order code character**
100 mm	= (G)
diameter: d_2	**Order No**
32 mm	= (7)
Type:	**Order No**
punch larger, heavy duty	= (5)
Version:	**Order No**
Blank	= (0)
Punch:	
with ejector pin	= 27

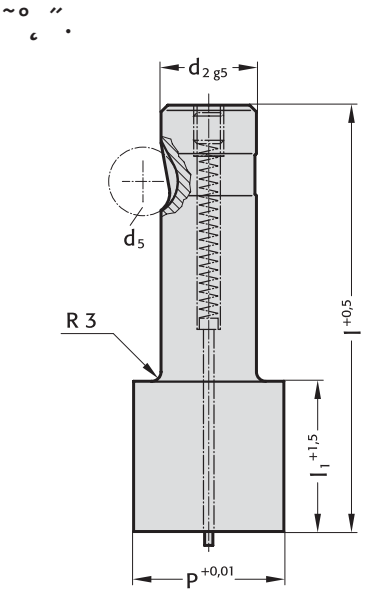
Material:

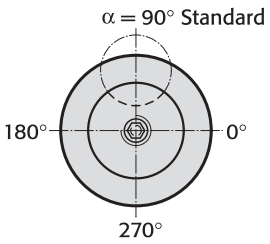
HSS
Hardness 62 ± 2 HRC

Execution:

Shaft and punch diameter fine ground.
Special dimensions on request.

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





2715. Ball lock punch, punch larger than shaft, round, with ejector pin, heavy duty

d_2 / (Order No)	d_5	P	l_1 / (Order No)	l / (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	12	13 - 32	19 (2) 30 (4)		●	●	●
16 / (4)	12	16 - 38	19 (2) 30 (4)		●	●	●
20 / (5)	12	20 - 40	19 (2) 30 (4)		●	●	●
25 / (6)	12	25 - 44	19 (2) 30 (4)		●	●	●
32 / (7)	12	32 - 50	19 (2) 30 (4)		●	●	●
40 / (9)	12	40 - 56	19 (2) 30 (4)		●	●	●

CAD

Material:

HSS
Hardness 62 ± 2 HRC

Execution:

Shaft and punch diameter fine ground.
Special dimensions on request.

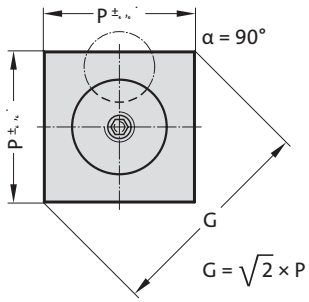
Ordering-code (example):

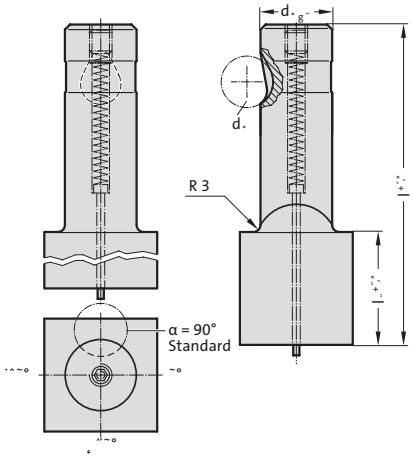
2715.7G2.3210

Format: Round
P = ∅ 32,1 mm = 3210
Punch cutting length: l_1 **Order No**
19 mm = (2)
length: l **Order code character**
100 mm = (G)
diameter: d_2 **Order No**
32 mm = (7)
Type: **Order No**
punch larger, heavy duty = (5)
Version: **Order No**
Round = (1)
Punch:
with ejector pin = 27

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

2725.





2725. Ball lock punch, punch larger than shaft, square, with ejector pin, heavy duty

d_2 / (Order No)	d_5	P_{min}	G_{max}	l_1 / (Order No)	l / (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	12	9.19	32	19 (2) 30 (4)		●	●	●
16 / (4)	12	11.31	38	19 (2) 30 (4)		●	●	●
20 / (5)	12	14.14	40	19 (2) 30 (4)		●	●	●
25 / (6)	12	17.68	44	19 (2) 30 (4)		●	●	●
32 / (7)	12	22.63	50	19 (2) 30 (4)		●	●	●
40 / (9)	12	28.28	56	19 (2) 30 (4)		●	●	●

Ordering-code (example):

2 7 2 5 . 4 F 4 . 2 5 0 0 B

Angle:	90°	**Order code character** = (B)
Format: Square, length P	P = 25,0 mm	= 2500
Punch cutting length: l_1	30 mm	**Order No** = (4)
Length: l	90 mm	**Order code character** = (F)
Diameter: d_2	16 mm	**Order No** = (4)
Type:	punch larger, heavy duty	**Order No** = (5)
Version:	Square	**Order No** = (2)
Punch:	with ejector pin	= 27

Material:

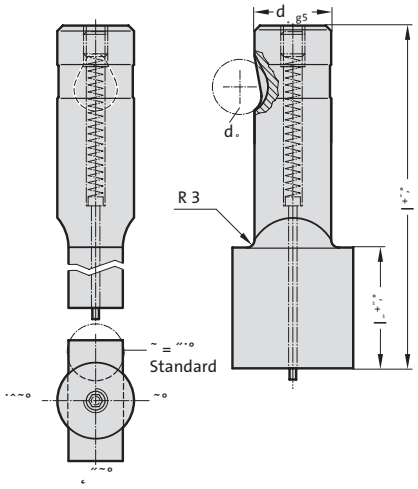
HSS
Hardness 62 ± 2 HRC

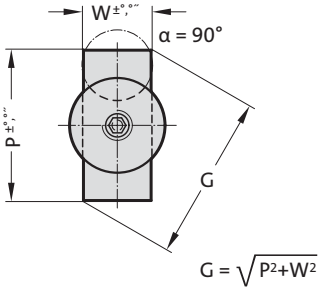
Execution:

Shaft and punch shape fine ground.
Special dimensions on request.

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

2735.





2735. Ball lock punch, punch larger than shaft, rectangular, with ejector pin, heavy duty

d_2 / (Order No)	d_5	W_{min}	G_{max}	l_1 / (Order No)	l / (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	12	5	32	19 (2) 30 (4)		●	●	●
16 / (4)	12	6.5	38	19 (2) 30 (4)		●	●	●
20 / (5)	12	8	40	19 (2) 30 (4)		●	●	●
25 / (6)	12	10	44	19 (2) 30 (4)		●	●	●
32 / (7)	12	11.5	50	19 (2) 30 (4)		●	●	●
40 / (9)	12	14	56	19 (2) 30 (4)		●	●	●

CAD

Material:

HSS
Hardness 62 ± 2 HRC

Execution:

Shaft and punch shape fine ground.
Special dimensions on request.

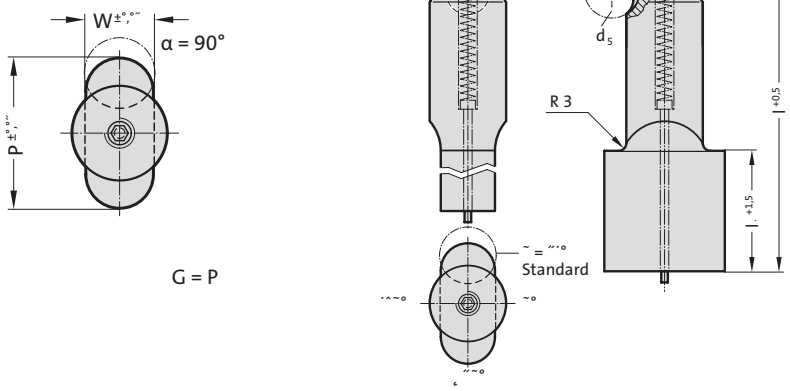
Ordering-code (example):

2735.4F4.1400.1100B

Angle:	**Order code character**
90°	= (B)
Format: Rectangular, width W	
W = 11,0 mm	= 1100
Format: Rectangular, length P	
P = 14,0 mm	= 1400
Punch cutting length: l_1	**Order No**
30 mm	= (4)
Length: l	**Order code character**
90 mm	= (F)
Diameter: d_2	**Order No**
16 mm	= (4)
Type:	**Order No**
punch larger, heavy duty	= (5)
Version:	**Order No**
Rectangular	= (3)
Punch:	
with ejector pin	= 27

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

2745.



2745. Ball lock punch, punch larger than shaft, slot, with ejector pin, heavy duty

d_2 / (Order No)	d_5	W_{min}	G_{max}	l_1 / (Order No)	l / (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	12	5	32	19 (2) 30 (4)		●	●	●
16 / (4)	12	6.5	38	19 (2) 30 (4)		●	●	●
20 / (5)	12	8	40	19 (2) 30 (4)		●	●	●
25 / (6)	12	10	44	19 (2) 30 (4)		●	●	●
32 / (7)	12	11.5	50	19 (2) 30 (4)		●	●	●
40 / (9)	12	14	56	19 (2) 30 (4)		●	●	●

Ordering-code (example):

2 7 4 5 . 4 F 4 . 1 4 0 0 . 1 1 0 0 B

	Angle	**Order code character**
	90°	= (B)
	Format: Slot, width W	
	W = 11,0 mm	= 1100
	Format: Slot, length P	
	P = 14,0 mm	= 1400
	Punch cutting length: l_1	**Order No**
	30 mm	= (4)
	Length: l	**Order code character**
	90 mm	= (F)
	Diameter: d_2	**Order No**
	16 mm	= (4)
	Type:	**Order No**
	punch larger, heavy duty	= (5)
	Version:	**Order No**
	Slot	= (4)
	Punch:	
	with ejector pin	= 27

Material:

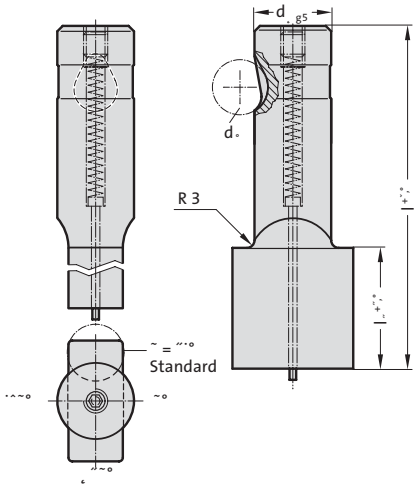
HSS
Hardness 62 ± 2 HRC

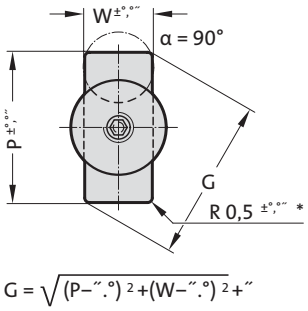
Execution:

Shaft and punch shape fine ground.
Special dimensions on request.

Ball lock punch, punch larger than shaft, rectangle with radiussed corners, with ejector pin, heavy duty

2755.





2755. Ball lock punch, punch larger than shaft, rectangle with radiussed corners, with ejector pin, heavy duty

d_2 / (Order No)	d_5	W_{min}	G_{max}	l_1 / (Order No)	l / (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	12	5	32	19 (2) 30 (4)		●	●	●
16 / (4)	12	6.5	38	19 (2) 30 (4)		●	●	●
20 / (5)	12	8	40	19 (2) 30 (4)		●	●	●
25 / (6)	12	10	44	19 (2) 30 (4)		●	●	●
32 / (7)	12	11.5	50	19 (2) 30 (4)		●	●	●
40 / (9)	12	14	56	19 (2) 30 (4)		●	●	●

CAD

Material:

HSS
Hardness 62 ± 2 HRC

Execution:

Shaft and punch shape fine ground.
Special dimensions on request.
* For other radius options, see standardised special shapes.

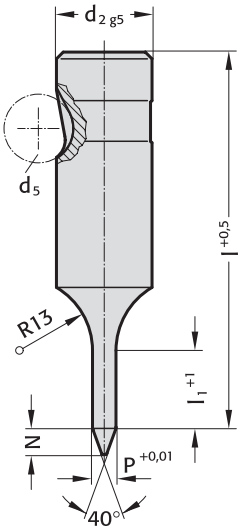
Ordering-code (example):

2755.3F2.1215.1100B

Angle:	**Order code character**
90°	= (B)
Format: Rectangle with radiused corners, width W	
W = 11,0 mm	= 1100
Format: Rectangle with radiused corners, length P	
P = 12,15 mm	= 1215
Punch cutting length: l_1	**Order No**
19 mm	= (2)
Length: l	**Order code character**
90 mm	= (F)
Diameter: d_2	**Order No**
13 mm	= (3)
Type:	**Order No**
punch larger, heavy duty	= (5)
Version:	**Order No**
Rectangle with radiused corners	= (5)
Punch:	
with ejector pin	= 27

Ball lock pilot pin, with tapered tip, heavy duty

2263.



2263. Ball lock pilot pin, with tapered tip, heavy duty

d_2 / (Order No)	d_5	P	l_1 / (Order No)	N	l / (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)	140 (K)	150 (I)
10 / (2)	10	5,9-9,9	19 (2)	8		●	●	●	●	●			
13 / (3)	12	9,9-12,9	19 (2)	10		●	●	●	●	●	●	●	
16 / (4)	12	12,9-15,9	25 (3)	15		●	●	●	●	●	●	●	●
20 / (5)	12	15,9-19,9	25 (3)	20		●	●	●	●	●	●	●	●
25 / (6)	12	19,9-24,9	25 (3)	25			●	●	●	●	●	●	●
32 / (7)	12	24,9-31,9	25 (3)	30			●	●	●	●	●	●	●
40 / (9)	12	31,9-39,9	30 (4)	40			●	●	●	●	●	●	●

Ordering-code (example):

2 2 6 3 . 4 G 3 . 1 4 0 0

Format: Round
P = Ø 14,0 mm = 1400
Punch cutting length: l_1 **Order No**
25 mm = (3)
Length: l **Order code character**
100 mm = (G)
Diameter: d_2 **Order No**
16 mm = (4)
Type: **Order No**
heavy = (3)
Version: **Order No**
Pilot pin with tapered tip = (6)
Punch:
without ejector pin = 22

Material:

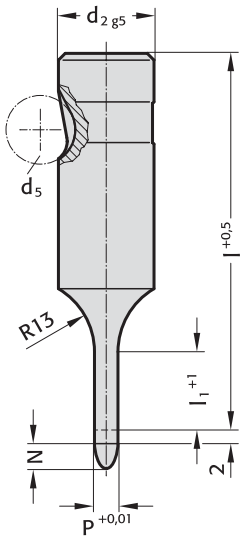
HSS
Hardness 62 ± 2 HRC

Execution:

Shaft and pilot pin fine ground.
Special dimensions on request.

Ball lock pilot pin, with parabolic tip, heavy duty

2273.



2273. Ball lock pilot pin, with parabolic tip, heavy duty

d_2 / (Order No)	d_5	P	l_1 / (Order No)	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)
10 / (2)	10	5,9-9,9	19 (2)		●	●	●	●	●		
13 / (3)	12	9,9-12,9	19 (2)		●	●	●	●	●	●	●
16 / (4)	12	12,9-15,9	25 (3)		●	●	●	●	●	●	●
20 / (5)	12	15,9-19,9	25 (3)		●	●	●	●	●	●	●
25 / (6)	12	19,9-24,9	25 (3)		●	●	●	●	●	●	●
32 / (7)	12	24,9-31,9	25 (3)			●	●	●	●	●	●
40 / (9)	12	31,9-39,9	30 (4)				●	●	●	●	●

Material:

HSS
Hardness 62 ± 2 HRC

Execution:

Shaft and pilot pin fine ground.
Special dimensions on request.

Note:

The 2 mm length provides full guidance before the blanking punch contacts the sheet metal.

Length of parabolic tip N:
= 8 mm where P ≤ 10 mm
=12 mm where P 10,1 mm - 15 mm
=15 mm where P > 15 mm

Ordering-code (example):

2 2 7 3 . 4 G 3 . 1 4 0 0

Format: Round	
P = ∅ 14,0 mm	= 1400
Punch cutting length: l_1	**Order No**
25 mm	= (3)
Length: l	**Order code character**
100 mm	= (G)
Diameter: d_2	**Order No**
16 mm	= (4)
Type:	**Order No**
heavy	= (3)
Version:	**Order No**
Pilot pin with parabolic tip	= (7)
Punch:	
without ejector pin	= 22

Punches
BOLT LOCK

05.2017

Punches and retainers BOLT LOCK

The development of the BOLT LOCK system is a logical continuation of today's quick-release systems for punches beyond a shaft diameter of 40 mm.

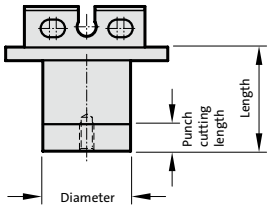
Since the punches are available for any geometries, the compact system can be used for a variety of applications.
An example of this is the use of punches to cut sheet metal parts, which are not manufactured as individual parts, but rather mainly as multiple parts for economic reasons. Large perforations in structured parts of the car body can be manufactured without a problem using the system.

In the area of follow-on composites, the system can also be used to cut the grating or remove the pc board.
The system makes a valuable contribution to the further standardisation of tools and connected advantages in regard to time, costs and quality.

- Designed as a replacement for today's serially produced parts previously manufactured individually.
- Punches available in standard shapes and customer-specific special shapes according to data record.
- High quality due to automated serial production.
- Cost savings in design due to CAD standard parts library. Data in the currently common data formats can be called worldwide directly through fibro.partcommunity.com and is thus always up-to-date free of cost.
- Low spatial requirement as conventional system and therefore also an option for saving operations.
- Geometrical changes of the cutting contour do not affect the retaining plate, thus permitting cost savings in case of changes.
- Low mounting effort in tool maintenance, quick-release system.
- Punches are provided with extraction thread in the standard version. Lateral borehole in the case of cutting form width W < 20 mm.

Ordering example
Punch BOLT LOCK

Note: See table for standard dimensions
Special dimensions to order



2 2 4 7 . 2 3 E 2 . 1 0 0 0 0 . 0 3 0 0 0 Z

Shape: slot
Length P = 100 mm

Shape: slot
Width W = 30 mm

Punch
22 without ejector pin

Punch cutting length: l_1	Order No
20	= 2

Length: l	Order Code character
77	= E

optional	Order Code character
with retaining plate-BOLT LOCK	= Z

Execution:	Order No
blank	= 0**
round	= 1*
square	= 2*
rectangular	= 3
slot	= 4
rectangle with radiused corners	= 5

*only for size (a x b): 01, 04, 05
**only available as CAD download
Note:
Special forms available upon customer's request.
Use blank 2207. for CAD data, see fibro.partcommunity.com.

Size (a_1 x b_1)	Order No
01 (80 x 55)	= 1
02 (100 x 40)	= 2
03 (160 x 40)	= 3
04 (120 x 80)	= 4
05 (160 x 120)	= 5
06 (240 x 45)	= 6

Typ:	Order No
BOLT LOCK	= 7

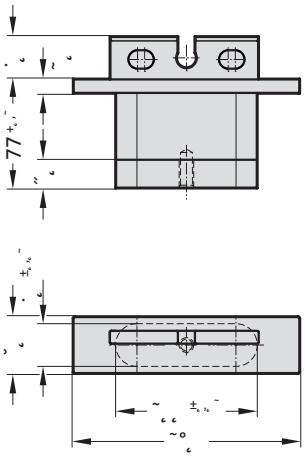
Material	Order No
HWS (1.2379)	= 2

other materials and coatings available upon request

Ordering example:

2 2 4 7 . 2 3 E 2 . 1 0 0 0 0 . 0 3 0 0 0 Z

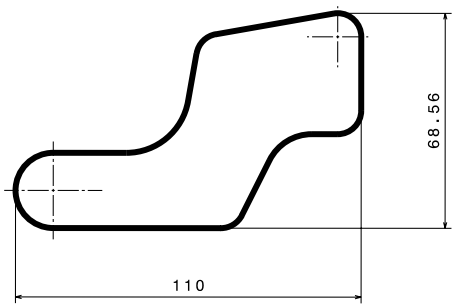
optional: with retaining plate BOLT LOCK (Z)
Shape: slot, Width W = 30 mm (03000)
Shape: slot, Length P = 100 mm (10000)
Punch cutting length: l_1 = 20 mm (2)
Length: l = 77 mm (E)
Size 03 (a_1 x b_1 = 160 x 40 mm) (3)
Material: HWS (1.2379) = (2)
Typ = BOLT LOCK (7)
Execution: slot (4)
Punch: without ejector pin (22)



Special designs
Punch BOLT LOCK

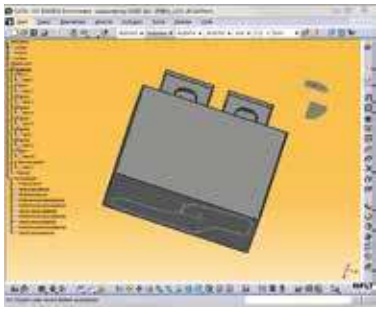
BOLT LOCK punches can be designed with individual cutting contours.
For this purpose, blanks are available as starting models at the fibro.partcommunity.com download portal.
In this starting model, the corresponding cutting contour can be imported using the CAD system
after download and preferably sent to FIBRO in STEP format.
Six sizes are available at the download portal.
During selection, the maximum dimensions X, Y of the cutting form apply as a limit.

Example:

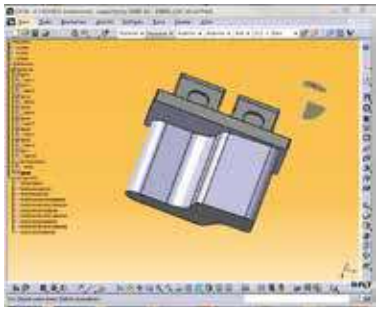


customer-specific cutting contour - max. dimensions of 110 x 69 mm

Selection of punch BOLT LOCK, blank according to the max. dimensions of the cutting form
Size 04 (A1 x B1 : 120 x 80 mm)

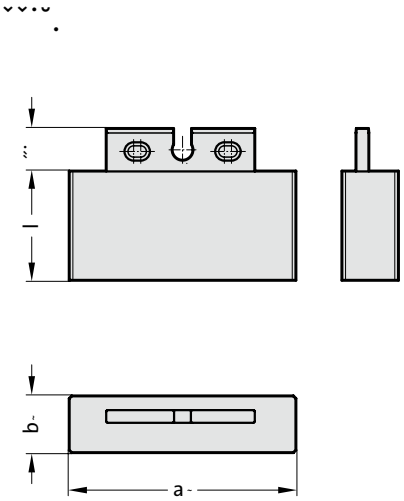


Download of model in desired CAD format (e.g.: STEP, CATIA, etc.)



Incorporation of the cutting contour into the punch BOLT LOCK blank model.
Send the data to FIBRO in STEP format.

Punch BOLT LOCK, blank



2207. Punch BOLT LOCK, blank

Size / (Order No)	a_1	b_1	l / (Order Code character)
01 / (1)	80	55	77 / (E)
02 / (2)	100	40	77 / (E)
03 / (3)	160	40	77 / (E)
04 / (4)	120	80	77 / (E)
05 / (5)	160	120	77 / (E)
06 / (6)	240	45	77 / (E)

Material:

HWS (1.2379)
Hardness 60 +2 HRC

Other materials upon request.

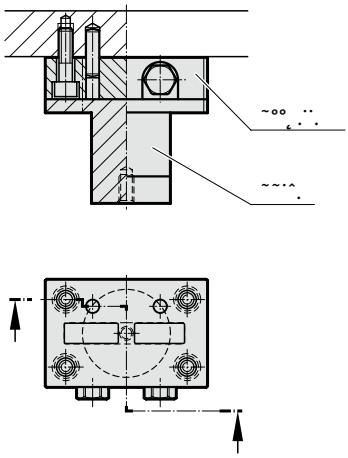
☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Note:

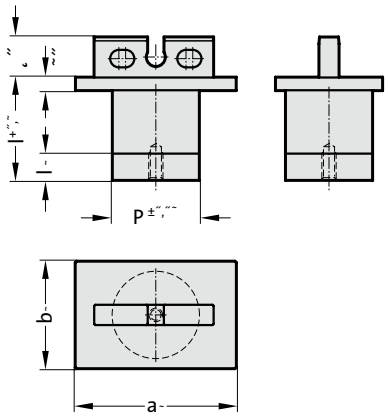
BOLT LOCK punches, blank, cannot be ordered. They are used only for customer-specific cutting contours/special designs.

Punch BOLT LOCK, round

Mounting example



2217.



2217. Punch BOLT LOCK, round

Size / (Order No)	a_1	b_1	P_{min}	P_{max}	l_1 / (Order No)	l / (Order Code character)
01 / (1)	80	55	35	54.9	20 / (2)	77 / (E)
04 / (4)	120	80	50	79.9	20 / (2)	77 / (E)
05 / (5)	160	120	75	119.9	20 / (2)	77 / (E)

Ordering-code (example):

2 2 1 7 . 2 1 E 2 . 0 5 0 0 0

Format: Round	P = Ø 50 mm	= 05000
Punch cutting length: l_1	20 mm	**Order No** = (2)
Length: l	77 mm	**Order code character** = (E)
Size:	01 (a_1 x b_1 : 80 x 55 mm)	**Order No** = (1)
Material:	HWS (1.2379)	**Order No** = (2)
Typ:	BOLT LOCK	**Order No** = (7)
Version:	Round	**Order No** = (1)
Punch:	without ejector pin	= 22

Material:

HWS (1.2379)
Hardness 60 +2 HRC

Other materials upon request.

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

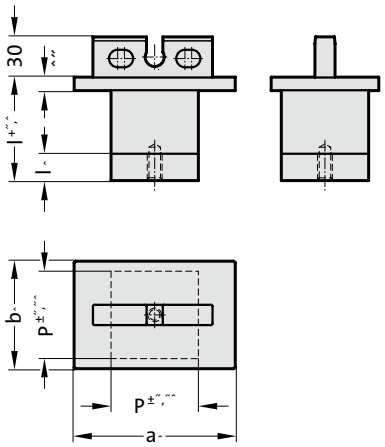
BOLT LOCK punches, round, are provided with an extraction thread (M10).

Note:

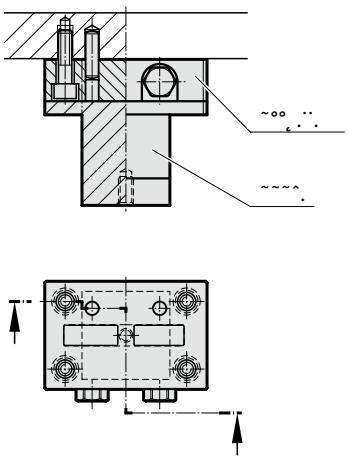
Order number for punch BOLT LOCK, round with retaining plate BOLT LOCK, including screws and pins:
2217.2□ E2.□□□□□Z

Punch BOLT LOCK, square

2227.



Mounting example



2227. Punch BOLT LOCK, square

Size / (Order No)	a_1	b_1	P_{min}	P_{max}	l_1 / (Order No)	l / (Order Code character)
01 / (1)	80	55	35	54.9	20 / (2)	77 / (E)
04 / (4)	120	80	50	79.9	20 / (2)	77 / (E)
05 / (5)	160	120	75	119.9	20 / (2)	77 / (E)

Material:

HWS (1.2379)
Hardness 60 +2 HRC

Other materials upon request.

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

BOLT LOCK punches, square, are provided with an extraction thread (M10).

Note:

Order number for punch BOLT LOCK, square with retaining plate BOLT LOCK, including screws and pins:
2227.2□ E2.□□□□□Z

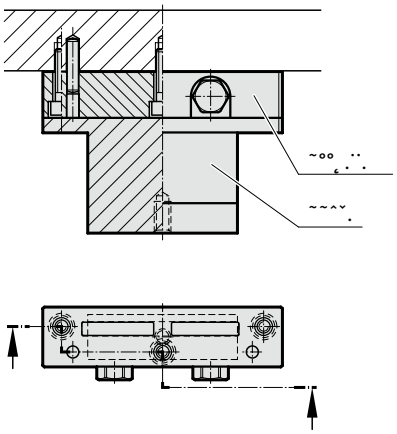
Ordering-code (example):

2 2 2 7 . 2 1 E 2 . 0 4 0 5 0

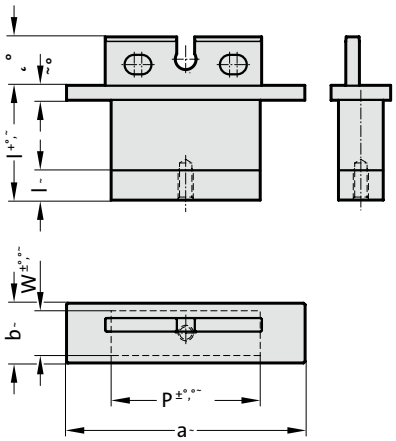
Format: Square	
P = 40,5 mm	= 04050
Punch cutting length: l_1	**Order No**
20 mm	= (2)
Length: l	**Order code character**
77 mm	= (E)
Size:	**Order No**
01 (a_1 x b_1 : 80 x 55 mm)	= (1)
Material:	**Order No**
HWS (1.2379)	= (2)
Typ:	**Order No**
BOLT LOCK	= (7)
Version:	**Order No**
Square	= (2)
Punch:	
without ejector pin	= 22

Punch BOLT LOCK, rectangular

Mounting example



2237.



2237. Punch BOLT LOCK, rectangular

Size / (Order No)	a_1	b_1	P_{min}	P_{max}	W_{min}	W_{max}	l_1 / (Order No)	l / (Order Code character)
01 / (1)	80	55	55	79.9	10	54.9	20 / (2)	77 / (E)
02 / (2)	100	40	40	99.9	10	39.9	20 / (2)	77 / (E)
03 / (3)	160	40	40	159.9	10	39.9	20 / (2)	77 / (E)
04 / (4)	120	80	80	119.9	10	79.9	20 / (2)	77 / (E)
05 / (5)	160	120	120	159.9	10	119.9	20 / (2)	77 / (E)
06 / (6)	240	45	45	239.9	10	44.9	20 / (2)	77 / (E)

Ordering-code (example):

2 2 3 7 . 2 1 E 2 . 0 7 0 5 0 . 0 4 5 5 0

Format: Rectangular, width W	
W = 45,5 mm	= 04550
Format: Rectangular, length P	
P = 70,5 mm	= 07050
Punch cutting length: l_1	**Order No**
20 mm	= (2)
Length: l	**Order code character**
77 mm	= (E)
Size:	**Order No**
01 (a_1 x b_1 : 80 x 55 mm)	= (1)
Material:	**Order No**
HWS (1.2379)	= (2)
Typ:	**Order No**
BOLT LOCK	= (7)
Version:	**Order No**
Rectangular	= (3)
Punch:	
without ejector pin	= 22

Material:

HWS (1.2379)
Hardness 60 +2 HRC

Other materials upon request.

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

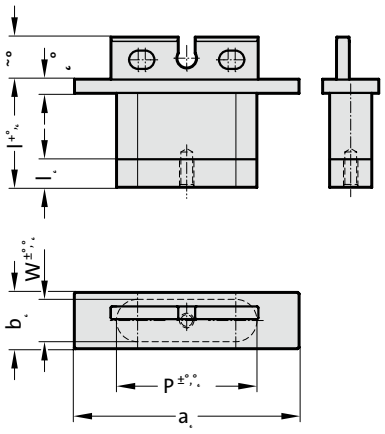
BOLT LOCK punches, rectangle, are provided with an extraction thread (M10).
For cutting form width W < 20 mm, the punch is provided with a transverse borehole (Ø 10 mm).

Note:

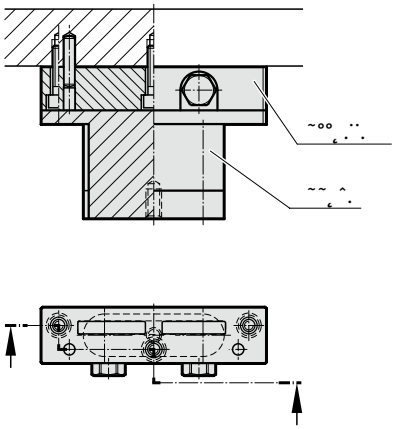
Order number for punch BOLT LOCK, rectangle with retaining plate BOLT LOCK, including screws and pins:
2237.2□ E2.□□□□□.□□□□□Z

Punch BOLT LOCK, slot

2247.



Mounting example



2247. Punch BOLT LOCK, slot

Size / (Order No)	a_1	b_1	P_{min}	P_{max}	W_{min}	W_{max}	l_1 / (Order No)	l / (Order Code character)
1 / (1)	80	55	55	79.9	10	54.9	20 / (2)	77 / (E)
2 / (2)	100	40	40	99.9	10	39.9	20 / (2)	77 / (E)
3 / (3)	160	40	40	159.9	10	39.9	20 / (2)	77 / (E)
4 / (4)	120	80	80	119.9	10	79.9	20 / (2)	77 / (E)
5 / (5)	160	120	120	159.9	10	119.9	20 / (2)	77 / (E)
6 / (6)	240	45	45	239.9	10	44.9	20 / (2)	77 / (E)

Material:

HWS (1.2379)
Hardness 60 +2 HRC

Other materials upon request.

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

BOLT LOCK punches with an slot are provided with an extraction thread (M10).
For cutting form width W < 20 mm, the punch is provided with a transverse bore (Ø 10 mm).

Note:

Order number for punch BOLT LOCK, slot with retaining plate BOLT LOCK, including screws and pins:
2247.2□ E2.□□□□□.□□□□□Z

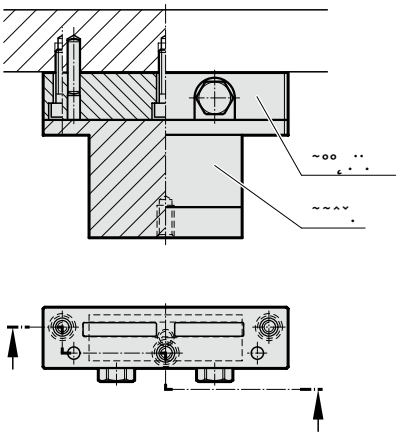
Ordering-code (example):

2247.21E2.07050.04550

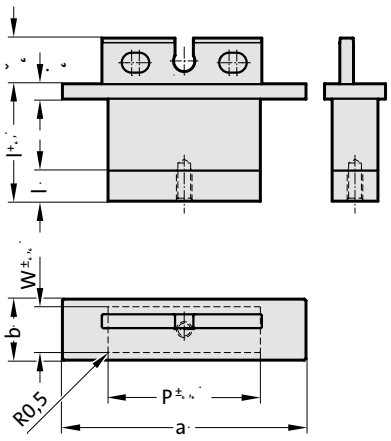
Format: Slot, width W	
W = 45,5 mm	= 04550
Format: Slot, length P	
P = 70,5 mm	= 07050
Punch cutting length: l_1	**Order No**
20 mm	= (2)
Length: l	**Order code character**
77 mm	= (E)
Size:	**Order No**
01 (a_1 x b_1 : 80 x 55 mm)	= (1)
Material:	**Order No**
HWS (1.2379)	= (2)
Typ:	**Order No**
BOLT LOCK	= (7)
Version:	**Order No**
Slot	= (4)
Punch:	
without ejector pin	= 22

Punch BOLT LOCK, rectangle with radiused corners

Mounting example



2257.



2257. Punch BOLT LOCK, rectangle with radiused corners

Size / (Order No)	a_1	b_1	P_{min}	P_{max}	W_{min}	W_{max}	l_1 / (Order No)	l / (Order Code character)
01 / (1)	80	55	55	79.9	10	54.9	20 / (E)	77 / (E)
02 / (2)	100	40	40	99.9	10	39.9	20 / (E)	77 / (E)
03 / (3)	160	40	40	159.9	10	39.9	20 / (E)	77 / (E)
04 / (4)	120	80	80	119.9	10	79.9	20 / (E)	77 / (E)
05 / (5)	160	120	120	159.9	10	119.9	20 / (E)	77 / (E)
06 / (6)	240	45	45	239.9	10	44.9	20 / (E)	77 / (E)

Ordering-code (example):

2 2 5 7 . 2 1 E 2 . 0 7 0 5 0 . 0 4 5 5 0

Format: Rectangle with radiused corners, width W	
W = 45,5 mm	= 04550
Format: Rectangle with radiused corners, length P	
P = 70,5 mm	= 07050
Punch cutting length: l_1	**Order No**
20 mm	= (2)
Length: l	**Order code character**
77 mm	= (E)
Size:	**Order No**
01 (a_1 x b_1 : 80 x 55 mm)	= (1)
Material:	**Order No**
HWS (1.2379)	= (2)
Typ:	**Order No**
BOLT LOCK	= (7)
Version:	**Order No**
Rectangle with radiused corners	= (5)
Punch:	
without ejector pin	= 22

Material:

HWS (1.2379)
Hardness 60 +2 HRC

Other materials upon request.

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

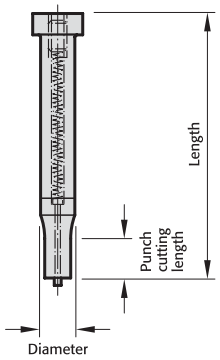
BOLT LOCK punches, rectangle with radius, are provided with an extraction thread (M10). For cutting form width W < 20 mm, the punch is provided with a transverse bore (Ø 10 mm).

Note:

Order number for punch BOLT LOCK, rectangle with radius and retaining plate BOLT LOCK, including screws and pins:
2257.2□ E2.□□□□□.□□□□□Z

Punches ISO 8020

Ordering example
Punches ISO 8020



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

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

Format: Slot length P = 6,5 mm

Format: Slot width W = 4,5 mm

Punch:
22 without ejector pin
27 with ejector pin

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

Type:	Order No
ISO	= 1

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

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

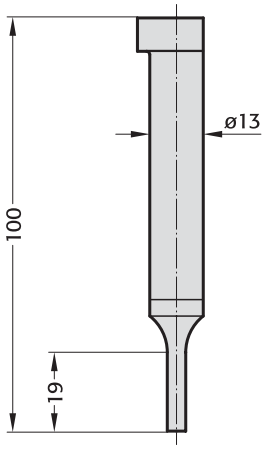
Lenght: l	Order Code character
50	= A
56	= B
63	= C
71	= D
80	= E
90	= F
100	= G
110	= H
120	= J
125	= K
140	= L
150	= M
200	= N
special	= X

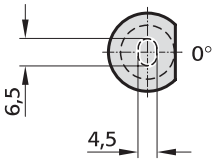
Angle:	Order Code character
0°	= A
90°	= B
180°	= C
270°	= D
special	= X

Ordering Code (Example):

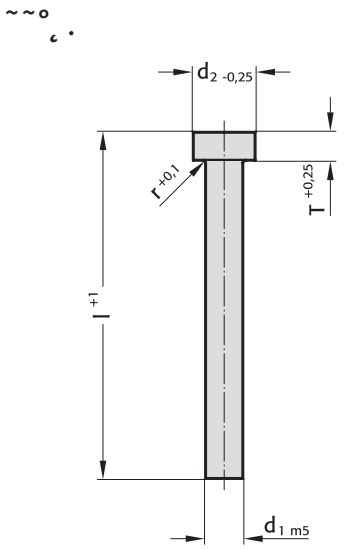
2 2 4 1 . 7 G 4 . 0 6 5 0 . 0 4 5 0 A

- Angle = 0° (A)
- Format: Slot, width W = 4,5 mm (0450)
- Format: Slot, length P = 6,5 mm (0650)
- Punch cutting 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)





Punch, blank, ISO 8020



2201. Punch, blank, ISO 8020

d_1 / (Order No)	d_2	r	T	l / (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)	150 (M)	200 (N)
3 / (1)	5	0.25	3		●	●	●	●	●		
4 / (2)	6	0.25	3		●	●	●	●	●		
5 / (3)	8	0.3	5		●	●	●	●	●		
6 / (4)	9	0.3	5		●	●	●	●	●		
8 / (5)	11	0.3	5		●	●	●	●	●		
10 / (6)	13	0.3	5		●	●	●	●	●	●	
13 / (7)	16	0.4	5		●	●	●	●	●	●	
16 / (8)	19	0.4	5		●	●	●	●	●	●	●
20 / (9)	23	0.4	5		●	●	●	●	●	●	●
25 / (10)	28	0.4	5		●	●	●	●	●	●	●
32 / (11)	35	0.4	5		●	●	●	●	●	●	●

Ordering code (example):

2201.7G .ASP

- **complete for material ASP**
- **Length: l** — 100 mm — **Order Code character** = (G)
- **Diameter: d_1** — 13 mm — **Order No** = (7)
- **Type:** — ISO — **Order No** = (1)
- **Version:** — blank — **Order No** = (0)
- **Punch:** — without ejector pin — = 22

Material:

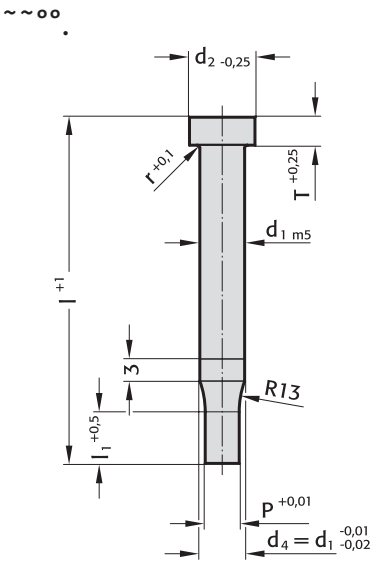
HSS
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

ASP 23 - ASP 2023
upon request
Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

Punch head hot upset-forged. Shoulder and shaft fine ground.
Special dimensions on request.

Punch, stepped, round, ISO 8020



2211. Punch, stepped, round, ISO 8020

d_1 / (Order No)	d_2	P	l_1 / (Order No)	r	T	l / (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)
3 / (1)	5	0,8-2,9	8 (1) 10 (2)	0.25	3		●	●	●	●	●
4 / (2)	6	1,0-3,9	8 (1) 13 (3)	0.25	3		●	●	●	●	●
5 / (3)	8	1,5-4,9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
6 / (4)	9	1,6-5,9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
8 / (5)	11	2,5-7,9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
10 / (6)	13	4,0-9,9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
13 / (7)	16	5,0-12.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
16 / (8)	19	8,0-15.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
20 / (9)	23	12,0-19.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
25 / (10)	28	16,5-24.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
32 / (11)	35	20,0-31.9	25 (5) 30 (6)	0.4	5		●	●	●	●	●

Material:

HSS
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

ASP 23 - ASP 2023
upon request
Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

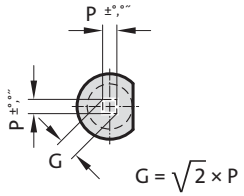
Punch head hot upset-forged. Shoulder, shaft and punch diameter fine ground.
Special dimensions on request.

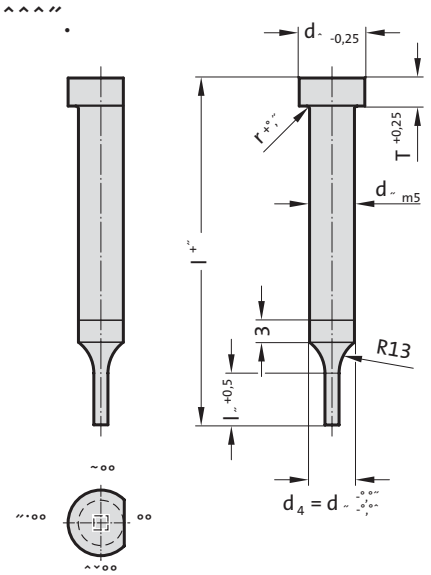
Ordering-code (example):

2 2 1 1 . 7 G 4 . 0 7 0 0

Format: Round	
P = ∅ 7,0 mm	= 0700
Punch cutting length: l_1	**Order No**
19 mm	= (4)
Length: l	**Order code character**
100 mm	= (G)
Diameter: d_1	**Order No**
13 mm	= (7)
Type:	**Order No**
ISO	= (1)
Version:	**Order No**
Round	= (1)
Punch:	
without ejector pin	= 22

Punch, stepped, square, ISO 8020





2221. Punch, stepped, square, ISO 8020

d_1 / (Order No)	d_2	P_{min}	G_{max}	l_1 / (Order No)	r	T	l / (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)
3 / (1)	5	0.5	2.9	8 (1) 10 (2)	0.25	3		●	●	●	●	●
4 / (2)	6	0.8	3.9	8 (1) 13 (3)	0.25	3		●	●	●	●	●
5 / (3)	8	1	4.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
6 / (4)	9	1.6	5.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
8 / (5)	11	2	7.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
10 / (6)	13	3.5	9.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
13 / (7)	16	4.5	12.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
16 / (8)	19	6	15.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
20 / (9)	23	8	19.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
25 / (10)	28	10	24.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
32 / (11)	35	10	31.9	25 (5) 30 (6)	0.4	5		●	●	●	●	●

Ordering-code (example):

2 2 2 1 . 10 E 5 . 1500 B

Angle:	90°	**Order code character** = (B)
Format: Square, length P	P = 15,0 mm	= 1500
Punch cutting length: l_1	25 mm	**Order No** = (5)
Length: l	80 mm	**Order code character** = (E)
Diameter: d_1	25 mm	**Order No** = (10)
Type:	ISO	**Order No** = (1)
Version:	Square	**Order No** = (2)
Punch:	without ejector pin	= 22

Material:

HSS
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

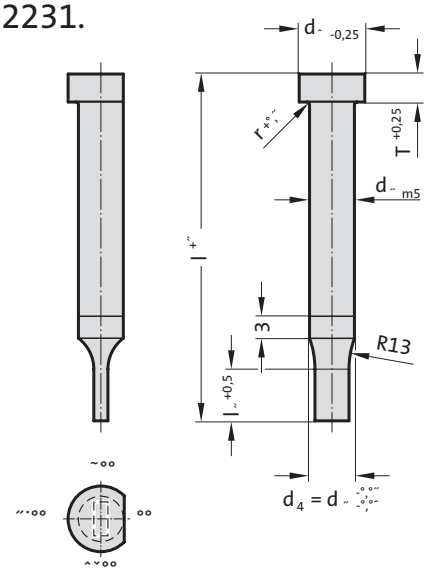
ASP 23 - ASP 2023
upon request
Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

Punch head hot upset-forged. Shoulder, shaft and punch shape fine ground.
The anti-rotation surface parallel to P = 0° as standard.
Special dimensions on request.

Punch, stepped, rectangular, ISO 8020

2231.



2231. Punch, stepped, rectangular, ISO 8020

d_1 / (Order No)	d_2	W_{min}	G_{max}	l_1 / (Order No)	r	T	l / (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)
3 / (1)	5	0.5	2.9	8 (1) 10 (2)	0.25	3		●	●	●	●	●
4 / (2)	6	0.8	3.9	8 (1) 13 (3)	0.25	3		●	●	●	●	●
5 / (3)	8	1	4.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
6 / (4)	9	1.6	5.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
8 / (5)	11	2	7.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
10 / (6)	13	3.5	9.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
13 / (7)	16	4.5	12.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
16 / (8)	19	6	15.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
20 / (9)	23	8	19.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
25 / (10)	28	10	24.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
32 / (11)	35	10	31.9	25 (5) 30 (6)	0.4	5		●	●	●	●	●

Material:

HSS
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

ASP 23 - ASP 2023
upon request
Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

Punch head hot upset-forged. Shoulder, shaft and punch shape fine ground.
The anti-rotation surface parallel to P = 0° as standard.
Special dimensions on request.

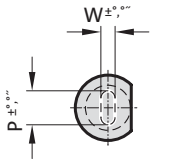
Ordering-code (example):

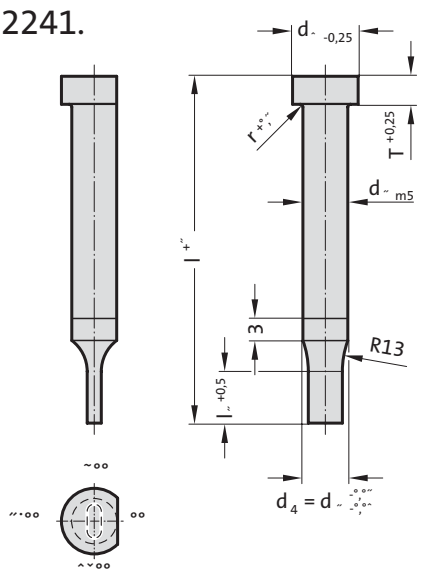
2 2 3 1 . 9 F 4 . 1 5 0 0 . 1 1 5 0 B

Angle:	**Order code character**
90°	= (B)
Format: Rectangular, width W	
W = 11,5 mm	= 1150
Format: Rectangular, length P	
P = 15,0 mm	= 1500
Punch cutting length: l_1	**Order No**
19 mm	= (4)
Length: l	**Order code character**
90 mm	= (F)
Diameter: d_1	**Order No**
20 mm	= (9)
Type:	**Order No**
ISO	= (1)
Version:	**Order No**
Rectangular	= (3)
Punch:	
without ejector pin	= 22

Punch, stepped, slot, ISO 8020

2241.





2241. Punch, stepped, slot, ISO 8020

d_1 / (Order No)	d_2	W_{min}	G_{max}	l_1 / (Order No)	r	T	l / (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)
3 / (1)	5	0.5	2.9	8 (1) 10 (2)	0.25	3		●	●	●	●	●
4 / (2)	6	0.8	3.9	8 (1) 13 (3)	0.25	3		●	●	●	●	●
5 / (3)	8	1	4.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
6 / (4)	9	1.6	5.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
8 / (5)	11	2	7.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
10 / (6)	13	3.5	9.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
13 / (7)	16	4.5	12.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
16 / (8)	19	6	15.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
20 / (9)	23	8	19.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
25 / (10)	28	10	24.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
32 / (11)	35	10	31.9	25 (5) 30 (6)	0.4	5		●	●	●	●	●

Ordering-code (example):

2 2 4 1 . 10 E 5 . 2 0 2 0 . 1 2 2 0 A

	Angle	**Order code character**
	0°	= (A)
	Format: Slot, width W	
	W = 12,2 mm	= 1220
	Format: Slot, length P	
	P = 20,20 mm	= 2020
	Punch cutting length: l_1	**Order No**
	25 mm	= (5)
	Length: l	**Order code character**
	80 mm	= (E)
	Diameter: d_1	**Order No**
	25 mm	= (10)
	Type:	**Order No**
	ISO	= (1)
	Version:	**Order No**
	Slot	= (4)
	Punch:	
	without ejector pin	= 22

Material:

HSS
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

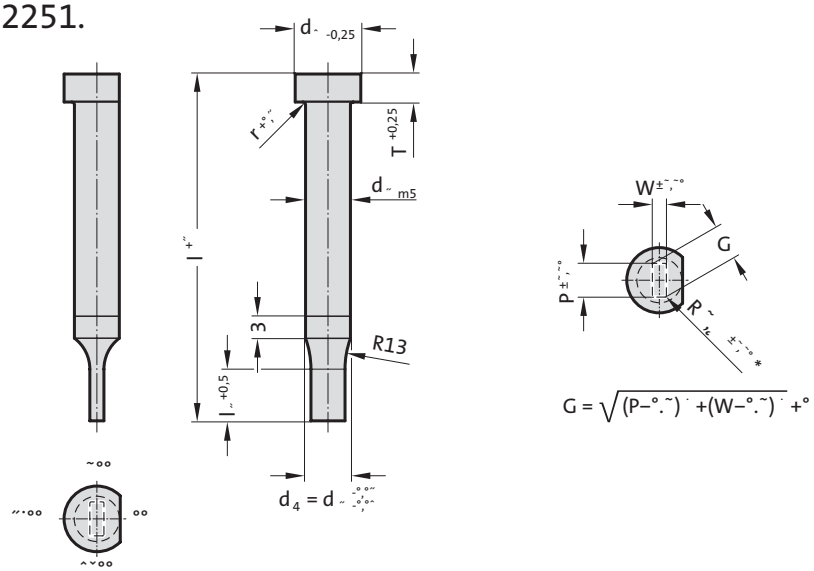
ASP 23 - ASP 2023
upon request
Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

Punch head hot upset-forged. Shoulder, shaft and punch shape fine ground.
The anti-rotation surface parallel to P = 0° as standard.
Special dimensions on request.

Punch, stepped, rectangle with radiused corners, ISO 8020

2251.



2251. Punch, stepped, rectangle with radiused corners, ISO 8020

d_1 / (Order No)	d_2	W_{min}	G_{max}	l_1 / (Order No)	r	T	l / (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)
3 / (1)	5	0.5	2.9	8 (1) 10 (2)	0.25	3		●	●	●	●	●
4 / (2)	6	0.8	3.9	8 (1) 13 (3)	0.25	3		●	●	●	●	●
5 / (3)	8	1	4.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
6 / (4)	9	1.6	5.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
8 / (5)	11	2	7.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
10 / (6)	13	3.5	9.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
13 / (7)	16	4.5	12.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
16 / (8)	19	6	15.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
20 / (9)	23	8	19.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
25 / (10)	28	10	24.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
32 / (11)	35	10	31.9	25 (5) 30 (6)	0.4	5		●	●	●	●	●

Material:

HSS
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

ASP 23 - ASP 2023
upon request
Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

Punch head hot upset-forged. Shoulder, shaft and punch shape fine ground.
The anti-rotation surface parallel to P = 0° as standard.
Special dimensions on request.
* For other radius options, see standardised special shapes.

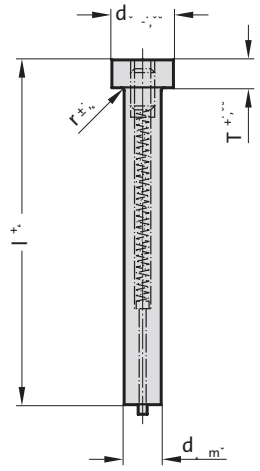
Ordering-code (example):

2 2 5 1 . 9 F 4 . 1 2 1 5 . 1 1 0 0 B

Angle:	**Order code character**
90°	= (B)
Format: Rectangle with radiused corners, width W	
W = 11,0 mm	= 1100
Format: Rectangle with radiused corners, length P	
P = 12,15 mm	= 1215
Punch cutting length: l_1	**Order No**
19 mm	= (4)
Length: l	**Order code character**
90 mm	= (F)
Diameter: d_1	**Order No**
20 mm	= (9)
Type:	**Order No**
ISO	= (1)
Version:	**Order No**
Rectangle with radiused corners	= (5)
Punch:	
without ejector pin	= 22

Punch, blank, with ejector pin, ISO 8020

2701.



2701. Punch, blank, with ejector pin, ISO 8020

d_1 / (Order No)	d_2	r	T	l / (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)
5 / (3)	8	0.3	5		●	●	●	●	●
6 / (4)	9	0.3	5		●	●	●	●	●
8 / (5)	11	0.3	5		●	●	●	●	●
10 / (6)	13	0.3	5		●	●	●	●	●
13 / (7)	16	0.4	5		●	●	●	●	●
16 / (8)	19	0.4	5		●	●	●	●	●
20 / (9)	23	0.4	5		●	●	●	●	●
25 / (10)	28	0.4	5		●	●	●	●	●
32 / (11)	35	0.4	5		●	●	●	●	●

Ordering-code (example):

2 7 0 1 . 11 G

Length: l		**Order code character**
100 mm		= (G)
Diameter: d_1		**Order No**
32 mm		= (11)
Type:		**Order No**
ISO		= (1)
Version:		**Order No**
blank		= (0)
Punch:		
with ejector pin		= 27

Material:

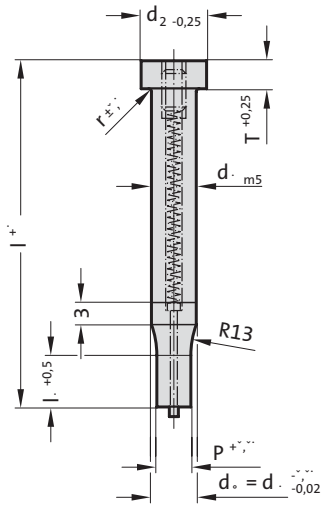
HSS
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

Execution:

Punch head hot upset-forged. Shoulder and shaft fine ground.
Special dimensions on request.

Punch, stepped, round, with ejector pin, ISO 8020

2711.



2711. Punch, stepped, round, with ejector pin, ISO 8020

d_1 / (Order No)	d_2	P	l_1 / (Order No)	r	T	l / (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)
5 / (3)	8	1,6-4,9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
6 / (4)	9	2,5-5,9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
8 / (5)	11	2,5-7,9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
10 / (6)	13	4,0-9,9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
13 / (7)	16	5,0-12.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
16 / (8)	19	8,0-15.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
20 / (9)	23	12,0-19.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
25 / (10)	28	16,5-24.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
32 / (11)	35	20,0-31.9	25 (5) 30 (6)	0.4	5		●	●	●	●	●

Material:

HSS
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

Execution:

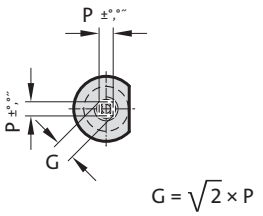
Punch head hot upset-forged. Shoulder, shaft and punch diameter fine ground.
Special dimensions on request.

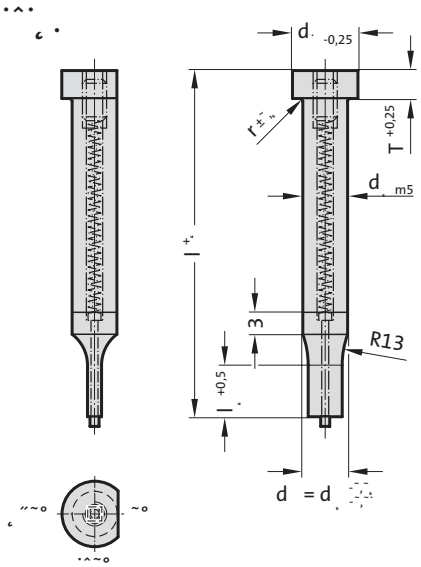
Ordering-code (example):

2711.7G4.0700

Format: Round	
P = ∅ 7,0 mm	= 0700
Punch cutting length: l_1	**Order No**
19 mm	= (4)
Length: l	**Order code character**
100 mm	= (G)
Diameter: d_1	**Order No**
13 mm	= (7)
Type:	**Order No**
ISO	= (1)
Version:	**Order No**
Round	= (1)
Punch:	
with ejector pin	= 27

Punch, stepped, square, with ejector pin, ISO 8020





2721. Punch, stepped, square, with ejector pin, ISO 8020

d_1 / (Order No)	d_2	P_{min}	G_{max}	l_1 / (Order No)	r	T	l / (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)
5 / (3)	8	1.6	4.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
6 / (4)	9	2.5	5.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
8 / (5)	11	2.5	7.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
10 / (6)	13	4	9.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
13 / (7)	16	5	12.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
16 / (8)	19	8	15.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
20 / (9)	23	12	19.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
25 / (10)	28	16.5	24.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
32 / (11)	35	20	31.9	25 (5) 30 (6)	0.4	5		●	●	●	●	●

Ordering-code (example):

2 7 2 1 . 1 0 D 5 . 1 6 5 0 A

Angle:	0°	**Order code character** = (A)
Format: Square, length P	P = 16,5 mm	= 1650
Punch cutting length: l_1	25 mm	**Order No** = (5)
Length: l	71 mm	**Order code character** = (D)
Diameter: d_1	25 mm	**Order No** = (10)
Type:	ISO	**Order No** = (1)
Version:	Square	**Order No** = (2)
Punch:	with ejector pin	= 27

Material:

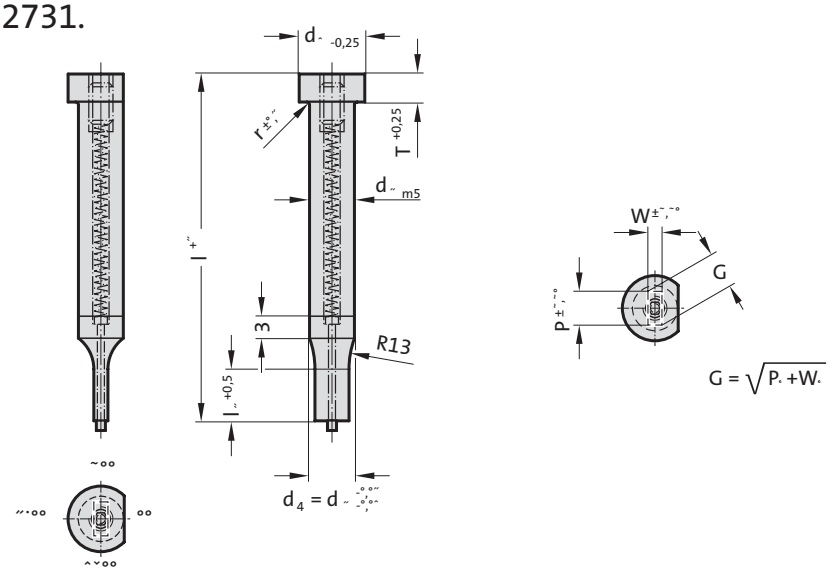
HSS
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

Execution:

Punch head hot upset-forged. Shoulder, shaft and punch shape fine ground.
The anti-rotation surface parallel to P = 0° as standard.
Special dimensions on request.

Punch, stepped, rectangular, with ejector pin, ISO 8020

2731.



2731. Punch, stepped, rectangular, with ejector pin, ISO 8020

d_1 / (Order No)	d_2	W_{min}	G_{max}	l_1 / (Order No)	r	T	l / (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)
5 / (3)	8	1.6	4.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
6 / (4)	9	2.5	5.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
8 / (5)	11	2.5	7.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
10 / (6)	13	4	9.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
13 / (7)	16	5	12.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
16 / (8)	19	8	15.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
20 / (9)	23	12	19.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
25 / (10)	28	16.5	24.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
32 / (11)	35	20	31.9	25 (5) 30 (6)	0.4	5		●	●	●	●	●

Material:

HSS
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

Execution:

Punch head hot upset-forged. Shoulder, shaft and punch shape fine ground.
The anti-rotation surface parallel to P = 0° as standard.
Special dimensions on request.

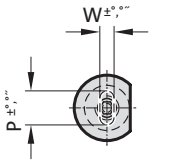
Ordering-code (example):

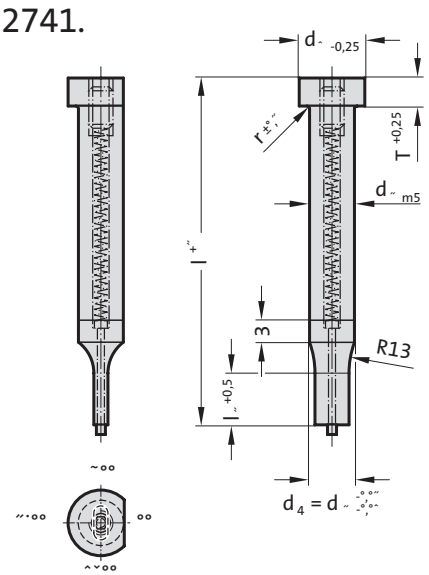
2731.9F4.1504.1210B

Angle:	**Order code character**
90°	= (B)
Format: Rectangular, width W	
W = 12,1 mm	= 1210
Format: Rectangular, length P	
P = 15,04 mm	= 1504
Punch cutting length: l_1	**Order No**
19 mm	= (4)
Length: l	**Order code character**
90 mm	= (F)
Diameter: d_1	**Order No**
20 mm	= (9)
Type:	**Order No**
ISO	= (1)
Version:	**Order No**
Rectangular	= (3)
Punch:	
with ejector pin	= 27

Punch, stepped, slot, with ejector pin, ISO 8020

2741.





2741. Punch, stepped, slot, with ejector pin, ISO 8020

d_1 / (Order No)	d_2	W_{min}	G_{max}	l_1 / (Order No)	r	T	l / (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)
5 / (3)	8	1.6	4.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
6 / (4)	9	2.5	5.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
8 / (5)	11	2.5	7.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
10 / (6)	13	4	9.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
13 / (7)	16	5	12.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
16 / (8)	19	8	15.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
20 / (9)	23	12	19.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
25 / (10)	28	16.5	24.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
32 / (11)	35	20	31.9	25 (5) 30 (6)	0.4	5		●	●	●	●	●

Ordering-code (example):

2 7 4 1 . 10 D 4 . 2 0 4 0 . 1 6 5 0 B

	Angle	**Order code character**
	90°	= (B)
	Format: Slot, width W	
	W = 16,5 mm	= 1650
	Format: Slot, length P	
	P = 20,4 mm	= 2040
	Punch cutting length: l_1	**Order No**
	19 mm	= (4)
	Length: l	**Order code character**
	71 mm	= (D)
	Diameter: d_1	**Order No**
	25 mm	= (10)
	Type:	**Order No**
	ISO	= (1)
	Version:	**Order No**
	Slot	= (4)
	Punch:	
	with ejector pin	= 27

Material:

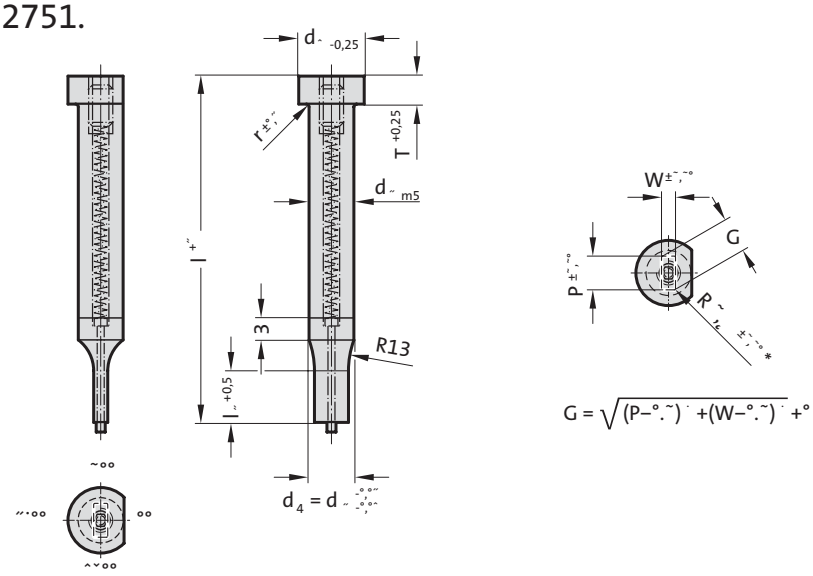
HSS
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

Execution:

Punch head hot upset-forged. Shoulder, shaft and punch shape fine ground.
The anti-rotation surface parallel to P = 0° as standard.
Special dimensions on request.

Punch, stepped, rectangle with radiussed corners, with ejector pin, ISO 8020

2751.



2751. Punch, stepped, rectangle with radiussed corners, with ejector pin, ISO 8020

d_1 / (Order No)	d_2	W_{min}	G_{max}	l_1 / (Order No)	r	T	l / (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)
5 / (3)	8	1.6	4.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
6 / (4)	9	2.5	5.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
8 / (5)	11	2.5	7.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
10 / (6)	13	4	9.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
13 / (7)	16	5	12.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
16 / (8)	19	8	15.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
20 / (9)	23	12	19.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
25 / (10)	28	16.5	24.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
32 / (11)	35	20	31.9	25 (5) 30 (6)	0.4	5		●	●	●	●	●

Material:

HSS
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

Execution:

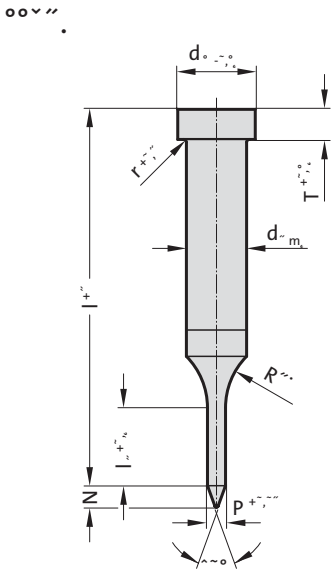
Punch head hot upset-forged. Shoulder, shaft and punch shape fine ground.
The anti-rotation surface parallel to P = 0° as standard.
Special dimensions on request.
* For other radius options, see standardised special shapes.

Ordering-code (example):

2751.9F4.1540.1210B

Angle:	**Order code character**
90°	= (B)
Format: Rectangle with radiused corners, width W	
W = 12,1 mm	= 1210
Format: Rectangle with radiused corners, length P	
P = 15,4 mm	= 1540
Punch cutting length: l_1	**Order No**
19 mm	= (4)
Length: l	**Order code character**
90 mm	= (F)
Diameter: d_1	**Order No**
20 mm	= (9)
Type:	**Order No**
ISO	= (1)
Version:	**Order No**
Rectangle with radiused corners	= (5)
Punch:	
with ejector pin	= 27

Pilot pin with tapered tip, ISO 8020



2261. Pilot pin with tapered tip, ISO 8020

d_1 / (Order No)	d_2	T	P	l_1 / (Order No)	N	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (K)	140 (I)
5 / (3)	8	5	1,0-4,9	13 (3)	4		●	●						
6 / (4)	9	5	1,6-5,9	13 (3)	5		●	●	●					
8 / (5)	11	5	2,5-7,9	13 (3)	6		●	●	●	●				
10 / (6)	13	5	4,0-9,9	13 (3) 19 (4)	8		●	●	●	●	●	●		
13 / (7)	16	5	5,0-12.9	13 (3) 19 (4)	10		●	●	●	●	●	●	●	
16 / (8)	19	5	8,0-15.9	13 (3) 19 (4) 25 (5)	15			●	●	●	●	●	●	●
20 / (9)	23	5	12,0-19.9	13 (3) 19 (4) 25 (5)	20			●	●	●	●	●	●	●
25 / (10)	28	5	16,5-24.9	13 (3) 19 (4) 25 (5)	25			●	●	●	●	●	●	●
32 / (11)	35	5	20,0-31.9	19 (4) 25 (5)	30				●	●	●	●	●	●

Ordering-code (example):

2 2 6 1 . 10 D 3 . 1 7 5 0

Format: Round		
P = ∅ 17,5 mm		= 1750
Punch cutting length: l_1		**Order No**
13 mm		= (3)
Length: l		**Order code character**
71 mm		= (D)
Diameter: d_1		**Order No**
25 mm		= (10)
Type:		**Order No**
ISO		= (1)
Version:		**Order No**
Pilot pin with tapered tip		= (6)
Punch:		
without ejector pin		= 22

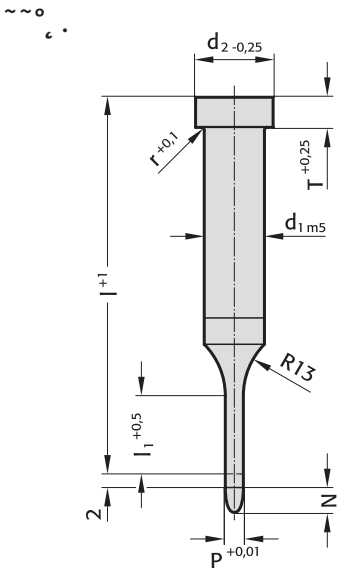
Material:

HSS
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

Execution:

Head hot upset-forged. Shoulder, shaft and pilot fine ground.
Special dimensions on request.

Pilot pin with parabolic tip, ISO 8020



2271. Pilot pin with parabolic tip, ISO 8020

d_1 / (Order No)	d_2	T	P	l_1 / (Order No)	l / (Order Code character)	50 (A)	56 (B)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
5 / (3)	8	5	1,0-4,9	10 (2) 13 (3)		●	●	●	●			
6 / (4)	9	5	1,6-5,9	10 (2) 13 (3)		●	●	●	●	●		
8 / (5)	11	5	2,5-7,9	10 (2) 13 (3)		●	●	●	●	●		
10 / (6)	13	5	4,0-9,9	10 (2) 13 (3) 19 (4)		●	●	●	●	●	●	●
13 / (7)	16	5	5,0-12.9	10 (2) 13 (3) 19 (4)		●	●	●	●	●	●	●
16 / (8)	19	5	8,0-15.9	13 (3) 19 (4)		●	●	●	●	●	●	●
20 / (9)	23	5	12,0-19.9	13 (3) 19 (4)			●	●	●	●	●	●
25 / (10)	28	5	16,5-24.9	13 (3) 19 (4)			●	●	●	●	●	●
32 / (11)	35	5	20,0-31.9	19 (4)					●	●	●	●

Material:

HSS
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

Execution:

Head hot upset-forged. Shoulder, shaft and pilot fine ground.
Special dimensions on request.

Note:

The 2 mm length provides full guidance before the blanking punch contacts the sheet metal.

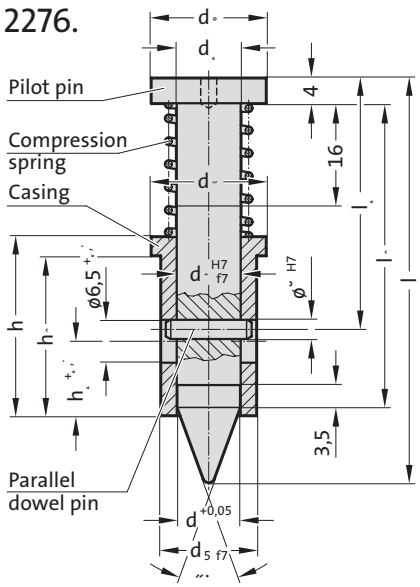
Length of parabolic tip N:
= 8 mm where P ≤ 10 mm
=12 mm where P 10,1 mm - 15 mm
=15 mm where P > 15 mm

Ordering-code (example):

2 2 7 1 . 1 0 D 3 . 1 7 5 0

Format: Round	
P = ∅ 17,5 mm	= 1750
Punch cutting length: l_1	**Order No**
13 mm	= (3)
Length: l	**Order code character**
71 mm	= (D)
Diameter: d_1	**Order No**
25 mm	= (10)
Type:	**Order No**
ISO	= (1)
Version:	**Order No**
Pilot pin with parabolic tip	= (7)
Punch:	
without ejector pin	= 22

Pilot unit to Mercedes-Benz Standard



2276. Pilot unit to Mercedes-Benz Standard

Order No	d	d_1	d_2	d_3	d_4	d_5	h	h_1	h_2	l_1	l_2	l	Spring force preloaded [daN]	Spring force pressed [daN]
2276.1.A.0980	9.8	10	10	18	18	15	28	25	12	47.5	39.3	63.2	4.9	6.2
2276.2.B.1580	15.8	16	16	24	30	26	28	25	12	54.5	46.3	72.5	4.8	5.6

Ordering-code (example):

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

	Diameter: d	
	9,8 mm	= 0980
	15,8 mm	= 1580
	Length: l	**Order code character**
	63,2 mm	= (A)
	72,5 mm	= (B)
	Diameter: d_1	**Order No**
	10 mm	= (1)
	16 mm	= (2)
	Standard:	**Order No**
	Mercedes	= (6)
	Version:	**Order No**
	Pilot pin	= (7)
		= 22

Description:

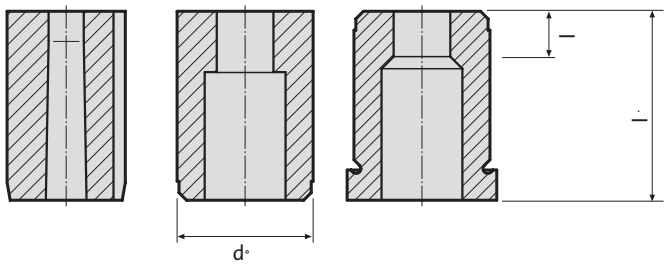
The pilot unit provides exact positioning of sheet metal parts.
There are 2 sizes.
The pilot unit 10 (2276.1.) can used for a hole diameter of 5 to 10 mm and is available as a finished item, 9.8 mm diameter.
The pilot unit 16 (2276.2.) is used for diameter > 10 - 16 mm and is available as a finished item, 15.8 mm diameter.
Smaller diameters have to be ground by the tool making department.

Note:

The pilot unit consists of:
Pilot pin, sleeve, compression spring, dowel pin.

Precision Matrixes

Ordering example
Matrixes



NB: See table for standard dimensions
Special dimensions to order

2 6 4 6 . 1 0 F 6 . 1 3 5 0 . 0 6 5 0 A 2

Format: Slot length P = 13,5 mm

Format: Slot width W = 6,5 mm

Matrixes:
26 = matrixes

Version:	Order No
blank (pilot hole bore)	= 0
round	= 1
square	= 2
rectangular	= 3
slot	= 4
rectangle with radiused corners	= 5
special shapes	= 9

Type:	Order No
automotive standard	= 5
without shoulder ISO 8977	= 6
with shoulder ISO 8977	= 7

Shape cutting length: l	Order No
2	= 1
3	= 2
4	= 3
5	= 4
6	= 5
8	= 6
10	= 7
12	= 8
special	= X

Diameter: d_2	Order No
5	= 1
6	= 2
8	= 3
10	= 4
13	= 5
16	= 6
20	= 7
22	= 8
25	= 9
32	= 10
38	= 11
40	= 12
45	= 13
50	= 14
56	= 15
63	= 16
71	= 17
76	= 18
85	= 19
90	= 20
100	= 21

Length: l_1	Order Code character
13	= A
16	= B
20	= C
22	= D
25	= E
28	= F
30	= G
32	= H
35	= J
40	= K
special	= X

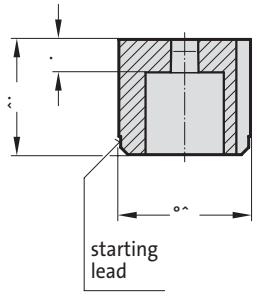
Angle:	Order Code character
0°	= A
90°	= B
180°	= C
270°	= D
special	= X

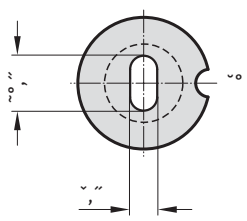
Anti-rotation element:	Order No
pin ∅3	= 1
pin ∅4	= 2
pin ∅6	= 3
polished surface (continuous)	= 4
polished surface top, 14 mm	= 5
polished surface bottom, 14 mm	= 6
special	= X

Ordering Code (Example):

2 6 4 6 . 1 0 F 6 . 1 3 5 0 . 0 6 5 0 A 2

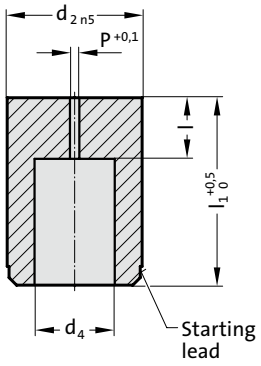
- Anti-rotation element: Pin ∅ = 4 mm (2)
- Angle = 0° (A)
- Format: Slot width W = 6,5 mm (0650)
- Format: Slot length P = 13,5 mm (1350)
- Shape cutting length: l = 8 mm (6)
- Length: l_1 = 28 mm (F)
- Diameter: d_2 = 32 mm (10)
- Type = without shoulder ISO 8977 (6)
- Version: Slot (4)
- Matrixes: Matrixes (26)





MATRIX WITHOUT SHOULDER, BLANK, ISO 8977

2606.



2606. Matrix without shoulder, blank, ISO 8977

d_2 / Order No	d_4	P	l / Order No	l_1 / (Order Code character)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)
5 / (1)	2.8	0.8	2 (1)		●	●	●	●	●	●	●	●	
6 / (2)	3.5	1	3 (2)		●	●	●	●	●	●	●	●	
8 / (3)	4	1	4 (3)		●	●	●	●	●	●	●	●	
10 / (4)	5.8	1	4 (3) 8 (6)		●	●	●	●	●	●	●	●	
13 / (5)	8	1.2	5 (4) 8 (6)			●	●	●	●	●	●	●	
16 / (6)	9.5	1.2	5 (4) 8 (6)			●	●	●	●	●	●	●	
20 / (7)	12	1.5	8 (6) 12 (8)			●	●	●	●	●	●	●	
22 / (8)	15	1.5	8 (6) 12 (8)			●	●	●	●	●	●	●	
25 / (9)	17.3	1.5	8 (6) 12 (8)			●	●	●	●	●	●	●	
32 / (10)	20.7	1.5	8 (6) 12 (8)			●	●	●	●	●	●	●	
38 / (11)	27.7	1.5	8 (6) 12 (8)					●	●	●	●	●	
40 / (12)	27.7	1.5	8 (6) 12 (8)					●	●	●	●	●	
50 / (14)	37	1.5	8 (6) 12 (8)					●	●	●	●	●	●

Ordering Code (example):

2606.10F8

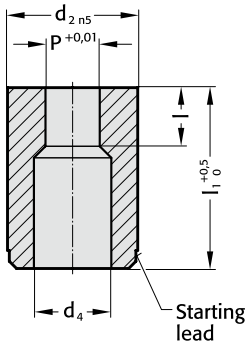
Shape cutting length: l 12 mm	**Order No** = (8)
Length: l_1 28 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (10)
Type: without shoulder ISO 8977	**Order No** = (6)
Execution: blank (pilot hole bore)	**Order No** = (0)
Matrix	= 26

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2, starting lead and face surfaces ground.
Diameter P is a bored pilot hole for wire EDM.
Special dimensions on request.

MATRIX WITHOUT SHOULDER, ROUND, ISO 8977

2616.



2616. Matrix without shoulder, round, ISO 8977

d_2 / Order No	d_4	P	l / Order No	l_1 / (Order Code character)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)
5 / (1)	2.8	1 - 2,4	2 (1)		●	●	●	●	●	●	●	●	
6 / (2)	3.5	1,6 - 3	3 (2)		●	●	●	●	●	●	●	●	
8 / (3)	4	2 - 3,5	4 (3)		●	●	●	●	●	●	●	●	
10 / (4)	5.8	2,5 - 5	4 (3) 8 (6)		●	●	●	●	●	●	●	●	
13 / (5)	8	4 - 7	5 (4) 8 (6)			●	●	●	●	●	●	●	
16 / (6)	9.5	6 - 9	5 (4) 8 (6)			●	●	●	●	●	●	●	
20 / (7)	12	8 - 11	8 (6) 12 (8)			●	●	●	●	●	●	●	
22 / (8)	15	9 - 14	8 (6) 12 (8)			●	●	●	●	●	●	●	
25 / (9)	17.3	10,7 - 16	8 (6) 12 (8)			●	●	●	●	●	●	●	
32 / (10)	20.7	15 - 20	8 (6) 12 (8)			●	●	●	●	●	●	●	
38 / (11)	27.7	19 - 27	8 (6) 12 (8)					●	●	●	●	●	
40 / (12)	27.7	19 - 27	8 (6) 12 (8)					●	●	●	●	●	
50 / (14)	37	26 - 36	8 (6) 12 (8)					●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2, starting lead and face surfaces ground.
Special dimensions on request.

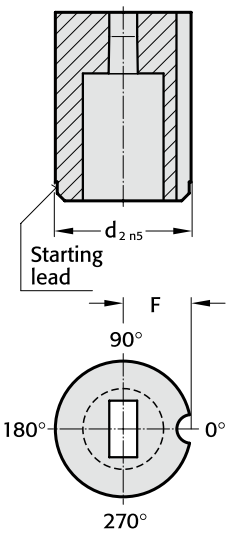
Ordering Code (example): without anti-rotation element

2616.10F8.1510

Shape: round P =ø15,1 mm	= 1510
Shape cutting length: l 12 mm	**Order No** = (8)
Length: l_1 28 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (10)
Type: without shoulder ISO 8977	**Order No** = (6)
Execution: round	**Order No** = (1)
Matrix	= 26

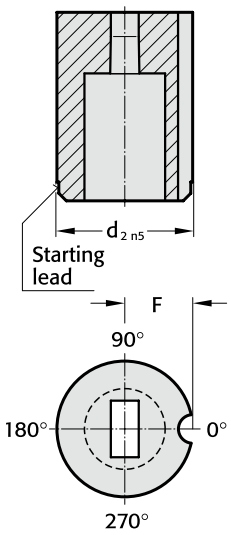
MATRIXES WITHOUT SHOULDER, CYLINDRICAL, ISO 8977, ANTI-ROTATION ELEMENTS

Anti-rotation element 1 (1)



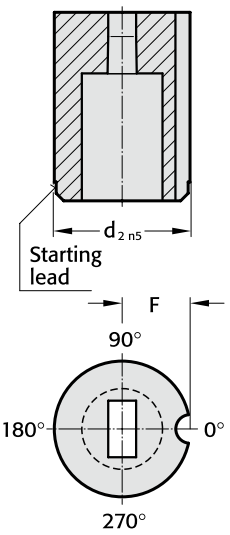
Pin [3	
d_2	F
10	5
13	6,5
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
50	25

Anti-rotation element 2 (2)



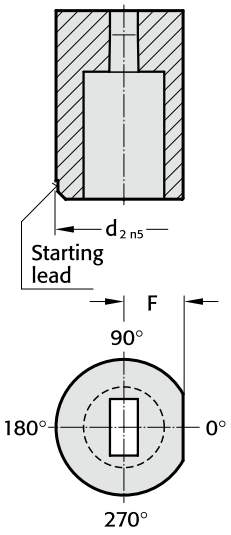
Pin [4	
d_2	F
10	6
13	7,2
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
50	25

Anti-rotation element 3 (3)



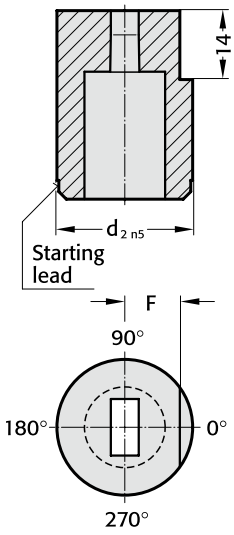
Pin [6	
d_2	F
10	7
13	8,2
16	9
20	11
22	12
25	13,5
32	16
38	19
40	20
50	25

Anti-rotation element 4 (4)



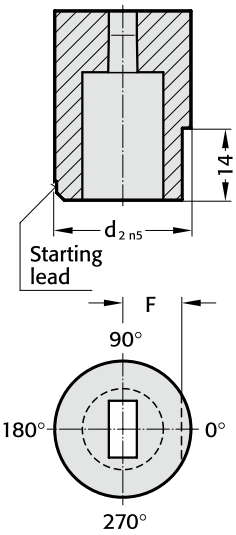
d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
50	23

Anti-rotation element 5 (5)



d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
50	23

Anti-rotation element 6 (6)



d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
50	23

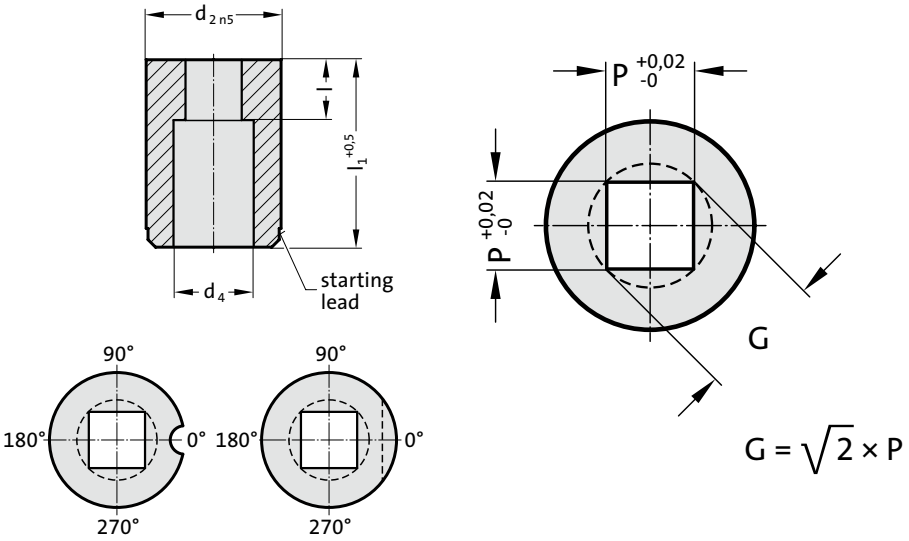
Ordering Code (example): with anti-rotation element from $d_2 \geq 10$ mm

2616.10F8.1510.A4

Anti-rotation element:	Polished surface (continuous)	**Order No** = (4)
Angle:	0°	**Order Code character** = (A)
Shape: round	P = ø 15,1 mm	= 1510
Shape cutting length: l	12 mm	**Order No** = (8)
Length: l_1	28 mm	**Order Code character** = (F)
Diameter: d_2	32 mm	**Order No** = (10)
Type:	without shoulder ISO 8977	**Order No** = (6)
Execution:	round	**Order No** = (1)
Matrix		= 26

MATRIX WITHOUT SHOULDER, SQUARE, ISO 8977

2626.



2626. Matrix without shoulder, square, ISO 8977

d_2 / Order No	d_4	P_{min}	G_{max}	l / Order No	l_1 / (Order Code character)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)
10 / (4)	5.8	1.2	5	4 (3) 8 (6)		●	●	●	●	●	●	●	●	
13 / (5)	8	2	7	5 (4) 8 (6)			●	●	●	●	●	●	●	
16 / (6)	9.5	2.4	9	5 (4) 8 (6)			●	●	●	●	●	●	●	
20 / (7)	12	3.2	11	8 (6) 12 (8)			●	●	●	●	●	●	●	
22 / (8)	15	4	14	8 (6) 12 (8)			●	●	●	●	●	●	●	
25 / (9)	17.3	4.8	16	8 (6) 12 (8)			●	●	●	●	●	●	●	
32 / (10)	20.7	5.5	20	8 (6) 12 (8)			●	●	●	●	●	●	●	
38 / (11)	27.7	6.4	27	8 (6) 12 (8)					●	●	●	●	●	
40 / (12)	27.7	6.4	27	8 (6) 12 (8)					●	●	●	●	●	
50 / (14)	37	9	36	8 (6) 12 (8)					●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2, starting lead and face surfaces ground.
Special dimensions on request.

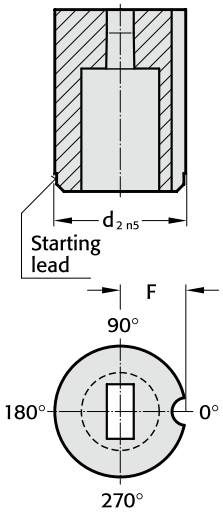
Ordering Code (example): with anti-rotation element

2626.10F8.1350.A3

Anti-rotation element: Pin ⌀ 6 mm	**Order No** = (3)
Angle: 0°	**Order Code character** = (A)
Shape: square, Length P P = 13,5 mm	= 1350
Shape cutting length: l 12 mm	**Order No** = (8)
Length: l_1 28 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (10)
Type: without shoulder ISO 8977	**Order No** = (6)
Execution: square	**Order No** = (2)
Matrix	= 26

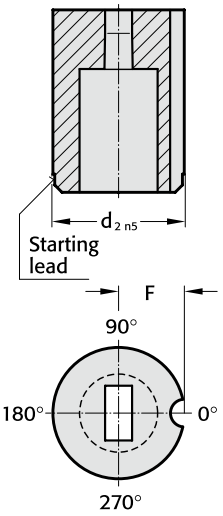
MATRIXES WITHOUT SHOULDER, CYLINDRICAL, ISO 8977, ANTI-ROTATION ELEMENTS

Anti-rotation element 1 (1)



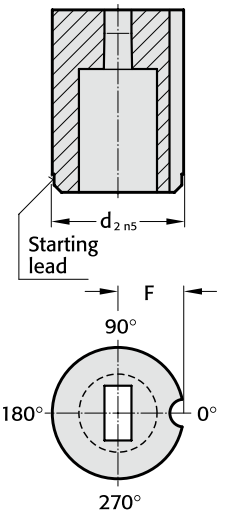
Pin ø3	
d_2	F
10	5
13	6,5
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
50	25

Anti-rotation element 2 (2)



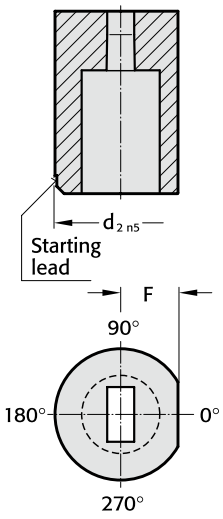
Pin ø4	
d_2	F
10	6
13	7,2
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
50	25

Anti-rotation element 3 (3)



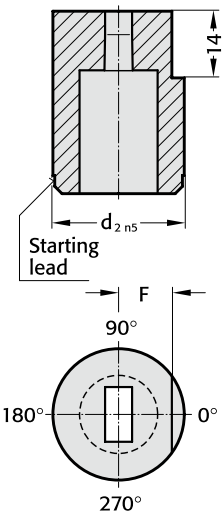
Pin ø6	
d_2	F
10	7
13	8,2
16	9
20	11
22	12
25	13,5
32	16
38	19
40	20
50	25

Anti-rotation element 4 (4)



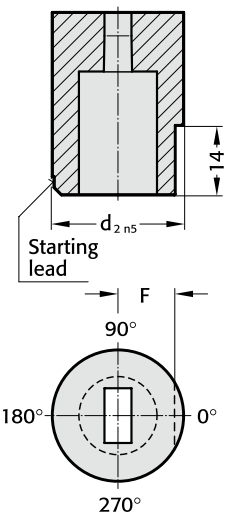
d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
50	23

Anti-rotation element 5 (5)



d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
50	23

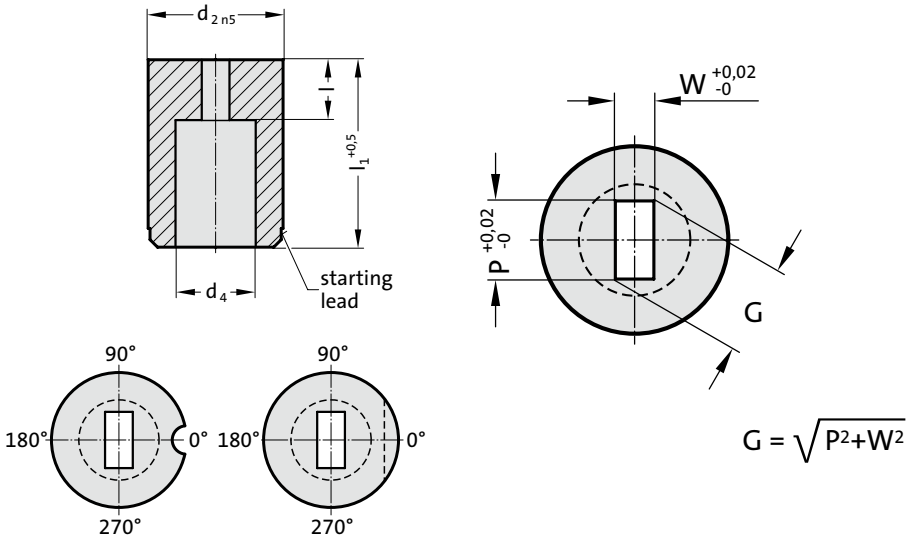
Anti-rotation element 6 (6)



d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
50	23

MATRIX WITHOUT SHOULDER, RECTANGULAR, ISO 8977

2636.



2636. Matrix without shoulder, rectangular, ISO 8977

d_2 / Order No	d_4	W_{min}	G_{max}	l / Order No	l_1 / (Order Code character)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)
10 / (4)	5.8	1.2	5	4 (3) 8 (6)		●	●	●	●	●	●	●	●	
13 / (5)	8	2	7	5 (4) 8 (6)			●	●	●	●	●	●	●	
16 / (6)	9.5	2.4	9	5 (4) 8 (6)			●	●	●	●	●	●	●	
20 / (7)	12	3.2	11	8 (6) 12 (8)			●	●	●	●	●	●	●	
22 / (8)	15	4	14	8 (6) 12 (8)			●	●	●	●	●	●	●	
25 / (9)	17.3	4.8	16	8 (6) 12 (8)			●	●	●	●	●	●	●	
32 / (10)	20.7	5.5	20	8 (6) 12 (8)			●	●	●	●	●	●	●	
38 / (11)	27.7	6.4	27	8 (6) 12 (8)					●	●	●	●	●	
40 / (12)	27.7	6.4	27	8 (6) 12 (8)					●	●	●	●	●	
50 / (14)	37	9	36	8 (6) 12 (8)					●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2, starting lead and face surfaces ground.
Special dimensions on request.

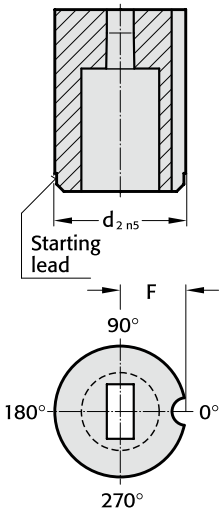
Ordering Code (example): with anti-rotation element

2636.10F8.1350.0650.B4

Anti-rotation element: Polished surface (continuous)	**Order No** = (4)
Angle: 90°	**Order Code character** = (B)
Shape: rectangular, Width W W = 6,5 mm	= 0650
Shape: rectangular, Length P P = 13,5 mm	= 1350
Shape cutting length: l 12 mm	**Order No** = (8)
Length: l_1 28 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (10)
Type: without shoulder ISO 8977	**Order No** = (6)
Execution: rectangular	**Order No** = (3)
Matrix	= 26

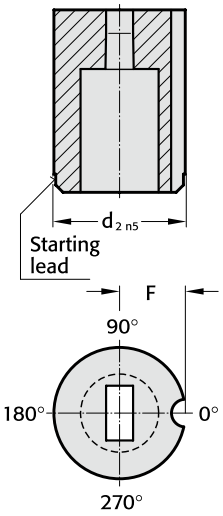
MATRIXES WITHOUT SHOULDER, CYLINDRICAL, ISO 8977, ANTI-ROTATION ELEMENTS

Anti-rotation element 1 (1)



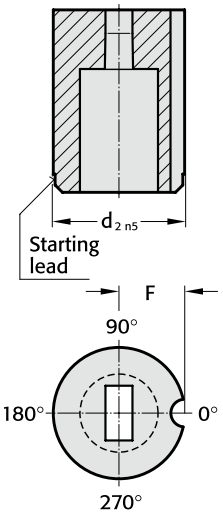
Pin [3	
d_2	F
10	5
13	6,5
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
50	25

Anti-rotation element 2 (2)



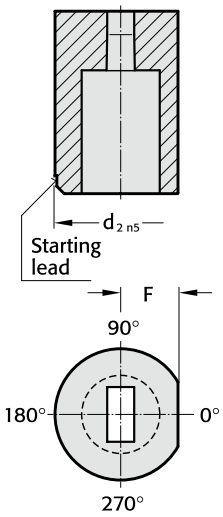
Pin [4	
d_2	F
10	6
13	7,2
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
50	25

Anti-rotation element 3 (3)



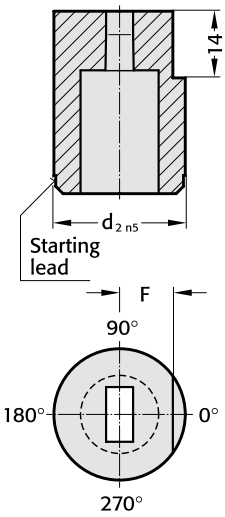
Pin [6	
d_2	F
10	7
13	8,2
16	9
20	11
22	12
25	13,5
32	16
38	19
40	20
50	25

Anti-rotation element 4 (4)



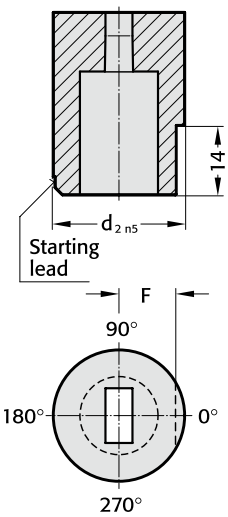
d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
50	23

Anti-rotation element 5 (5)



d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
50	23

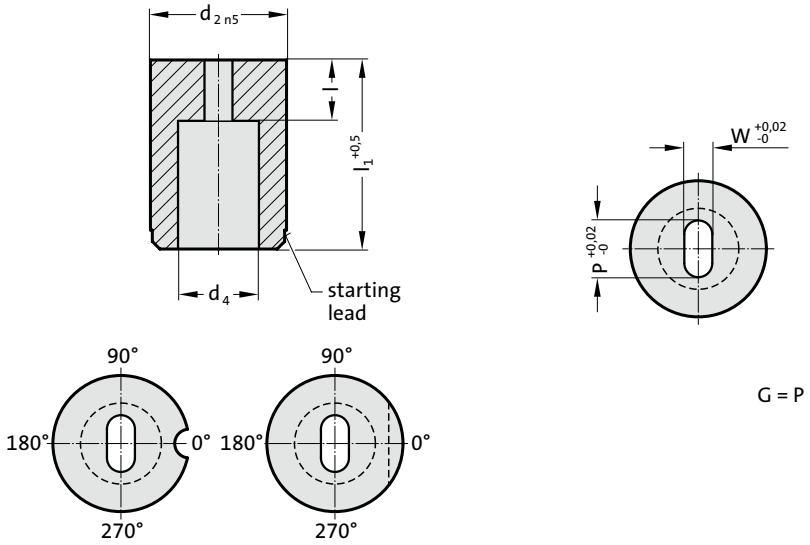
Anti-rotation element 6 (6)



d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
50	23

MATRIX WITHOUT SHOULDER, SLOT, ISO 8977

2646.



2646. Matrix without shoulder, slot, ISO 8977

d_2 / Order No	d_4	W_{min}	G_{max}	l / Order No	l_1 / (Order Code character)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)
10 / (4)	5.8	1.2	5	4 (3) 8 (6)		●	●	●	●	●	●	●	●	
13 / (5)	8	2	7	5 (4) 8 (6)			●	●	●	●	●	●	●	
16 / (6)	9.5	2.4	9	5 (4) 8 (6)			●	●	●	●	●	●	●	
20 / (7)	12	3.2	11	8 (6) 12 (8)			●	●	●	●	●	●	●	
22 / (8)	15	4	14	8 (6) 12 (8)			●	●	●	●	●	●	●	
25 / (9)	17.3	4.8	16	8 (6) 12 (8)			●	●	●	●	●	●	●	
32 / (10)	20.7	5.5	20	8 (6) 12 (8)			●	●	●	●	●	●	●	
38 / (11)	27.7	6.4	27	8 (6) 12 (8)					●	●	●	●	●	
40 / (12)	27.7	6.4	27	8 (6) 12 (8)					●	●	●	●	●	
50 / (14)	37	9	36	8 (6) 12 (8)					●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2, starting lead and face surfaces ground.
Special dimensions on request.

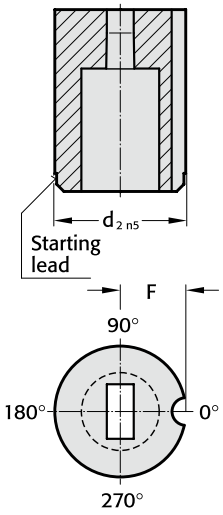
Ordering Code (example): with anti-rotation element

2646.10F8.1350.0650.B2

Anti-rotation element: Pin ⌀ 4 mm	**Order No** = (2)
Angle: 90°	**Order Code character** = (B)
Shape: slot, Width W W = 6,5 mm	= 0650
Shape: slot, Length P P = 13,5 mm	= 1350
Shape cutting length: l 12 mm	**Order No** = (8)
Length: l_1 28 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (10)
Type: without shoulder ISO 8977	**Order No** = (6)
Execution: slot	**Order No** = (4)
Matrix	= 26

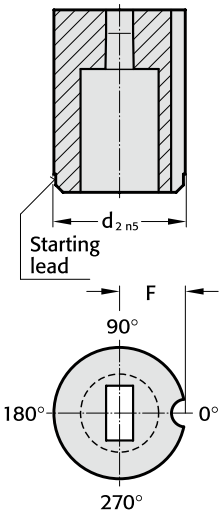
MATRIXES WITHOUT SHOULDER, CYLINDRICAL, ISO 8977, ANTI-ROTATION ELEMENTS

Anti-rotation element 1 (1)



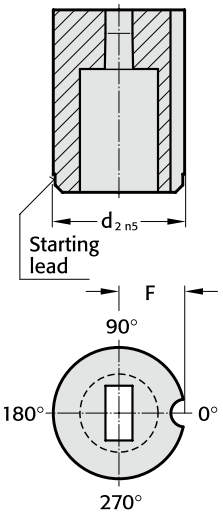
Pin [3	
d_2	F
10	5
13	6,5
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
50	25

Anti-rotation element 2 (2)



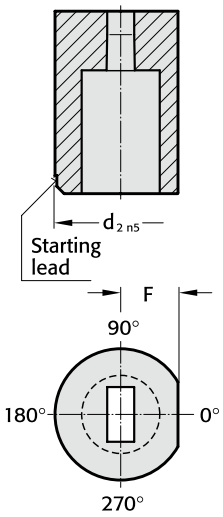
Pin [4	
d_2	F
10	6
13	7,2
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
50	25

Anti-rotation element 3 (3)



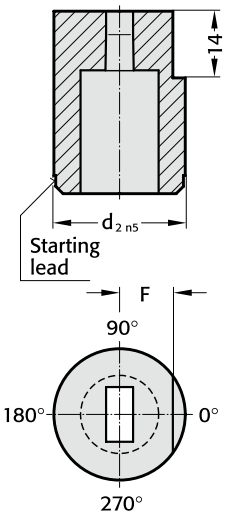
Pin [6	
d_2	F
10	7
13	8,2
16	9
20	11
22	12
25	13,5
32	16
38	19
40	20
50	25

Anti-rotation element 4 (4)



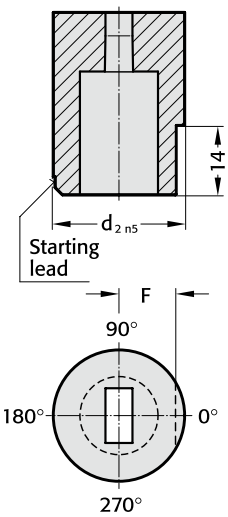
d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
50	23

Anti-rotation element 5 (5)



d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
50	23

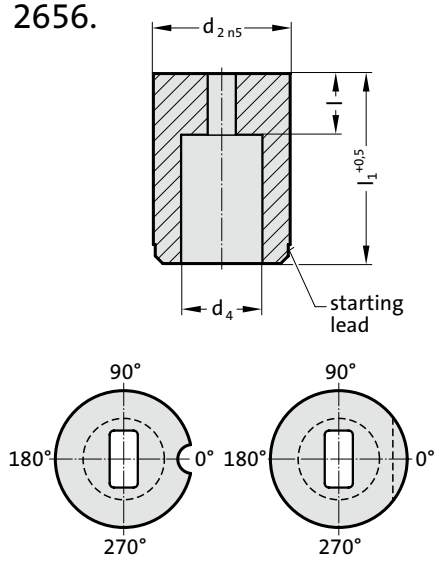
Anti-rotation element 6 (6)

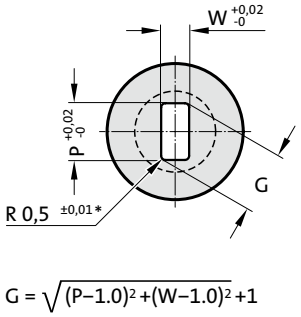


d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
50	23

MATRIX WITHOUT SHOULDER, RECTANGLE WITH RADIUSSED CORNERS, ISO 8977

2656.





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

2656. Matrix without shoulder, rectangle with radiussed corners, ISO 8977

d_2 / Order No	d_4	W_{min}	G_{max}	l / Order No	l_1 / (Order Code character)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)
10 / (4)	5.8	1.2	5	4 (3) 8 (6)		●	●	●	●	●	●	●	●	
13 / (5)	8	2	7	5 (4) 8 (6)			●	●	●	●	●	●	●	
16 / (6)	9.5	2.4	9	5 (4) 8 (6)			●	●	●	●	●	●	●	
20 / (7)	12	3.2	11	8 (6) 12 (8)			●	●	●	●	●	●	●	
22 / (8)	15	4	14	8 (6) 12 (8)			●	●	●	●	●	●	●	
25 / (9)	17.3	4.8	16	8 (6) 12 (8)			●	●	●	●	●	●	●	
32 / (10)	20.7	5.5	20	8 (6) 12 (8)			●	●	●	●	●	●	●	
38 / (11)	27.7	6.4	27	8 (6) 12 (8)					●	●	●	●	●	
40 / (12)	27.7	6.4	27	8 (6) 12 (8)					●	●	●	●	●	
50 / (14)	37	9	36	8 (6) 12 (8)					●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2, starting lead and face surfaces ground.
Special dimensions on request.
* For other radius options, see standardised special shapes.

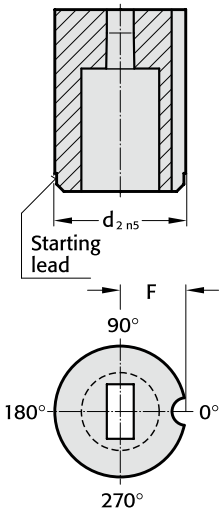
Ordering Code (example): with anti-rotation element

2656.10F8.1350.0650.A1

Anti-rotation element: Pin ⌀ 3 mm	**Order No** = (1)
Angle: 0°	**Order Code character** = (A)
Shape: rectangle with radiused corners, Width W W = 6,5 mm	= 0650
Shape: rectangle with radiused corners, Length P P = 13,5 mm	= 1350
Shape cutting length: l 12 mm	**Order No** = (8)
Length: l_1 28 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (10)
Type: without shoulder ISO 8977	**Order No** = (6)
Execution: rectangle with radiused corners	**Order No** = (5)
Matrix	= 26

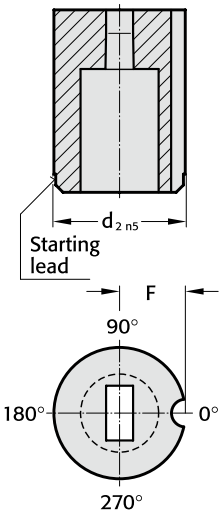
MATRIXES WITHOUT SHOULDER, CYLINDRICAL, ISO 8977, ANTI-ROTATION ELEMENTS

Anti-rotation element 1 (1)



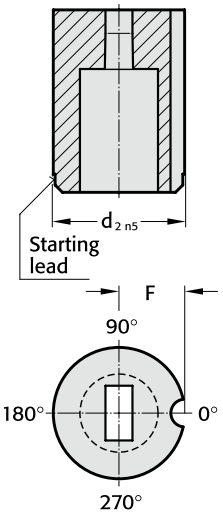
Pin [3	
d_2	F
10	5
13	6,5
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
50	25

Anti-rotation element 2 (2)



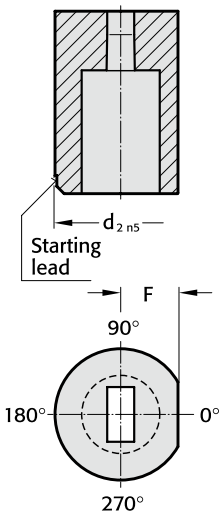
Pin [4	
d_2	F
10	6
13	7,2
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
50	25

Anti-rotation element 3 (3)



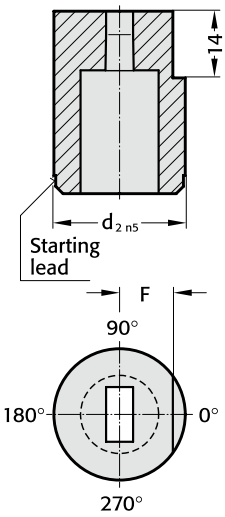
Pin [6	
d_2	F
10	7
13	8,2
16	9
20	11
22	12
25	13,5
32	16
38	19
40	20
50	25

Anti-rotation element 4 (4)



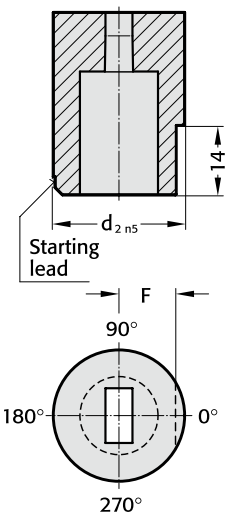
d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
50	23

Anti-rotation element 5 (5)



d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
50	23

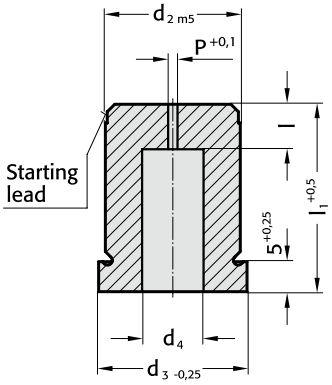
Anti-rotation element 6 (6)



d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
50	23

MATRIX WITH SHOULDER, BLANK, ISO 8977

2607.



2607. Matrix with shoulder, blank, ISO 8977

d_2 / Order No	d_3	d_4	P	l / Order No	l_1 / (Order Code character)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)
5 / (1)	8	2.8	0.8	2 (1)		●	●	●	●	●	●	●	●
6 / (2)	9	3.5	1	3 (2)		●	●	●	●	●	●	●	●
8 / (3)	11	4	1	4 (3)		●	●	●	●	●	●	●	●
10 / (4)	13	5.8	1	4 (3) 8 (6)		●	●	●	●	●	●	●	●
13 / (5)	16	8	1.2	5 (4) 8 (6)			●	●	●	●	●	●	●
16 / (6)	19	9.5	1.2	5 (4) 8 (6)			●	●	●	●	●	●	●
20 / (7)	23	12	1.5	8 (6) 12 (8)			●	●	●	●	●	●	●
22 / (8)	25	15	1.5	8 (6) 12 (8)			●	●	●	●	●	●	●
25 / (9)	28	17.3	1.5	8 (6) 12 (8)			●	●	●	●	●	●	●
32 / (10)	35	20.7	1.5	8 (6) 12 (8)			●	●	●	●	●	●	●
38 / (11)	41	27.7	1.5	8 (6) 12 (8)			●	●	●	●	●	●	●
40 / (12)	43	27.7	1.5	8 (6) 12 (8)			●	●	●	●	●	●	●
50 / (14)	53	37	1.5	8 (6) 12 (8)			●	●	●	●	●	●	●

Ordering Code (example):

2607.11E6

Shape cutting length: l 8 mm	**Order No** = (6)
Length: l_1 25 mm	**Order Code character** = (E)
Diameter: d_2 38 mm	**Order No** = (11)
Type: with shoulder ISO 8977	**Order No** = (7)
Execution: blank (pilot hole bore)	**Order No** = (0)
Matrix	= 26

Material:

HSS

Hardness 62 ± 2 HRC

Execution:

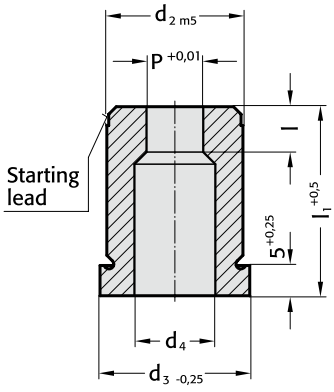
Diameter d_2, starting lead and face surfaces ground.

Diameter P is a bored pilot hole for wire EDM.

Special dimensions on request.

MATRIX WITH SHOULDER, ROUND, ISO 8977

2617.



2617. Matrix with shoulder, round, ISO 8977

d_2 / Order No	d_3	d_4	P	l / Order No	l_1 / (Order Code character)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)
5 / (1)	8	2.8	1 - 2,4	2 (1)		●	●	●	●	●	●	●	●
6 / (2)	9	3.5	1,6 - 3	3 (2)		●	●	●	●	●	●	●	●
8 / (3)	11	4	2 - 3,5	4 (3)		●	●	●	●	●	●	●	●
10 / (4)	13	5.8	2,5 - 5	4 (3) 8 (6)		●	●	●	●	●	●	●	●
13 / (5)	16	8	4 - 7	5 (4) 8 (6)			●	●	●	●	●	●	●
16 / (6)	19	9.5	6 - 9	5 (4) 8 (6)			●	●	●	●	●	●	●
20 / (7)	23	12	8 - 11	8 (6) 12 (8)			●	●	●	●	●	●	●
22 / (8)	25	15	9 - 14	8 (6) 12 (8)			●	●	●	●	●	●	●
25 / (9)	28	17.3	10,7 - 16	8 (6) 12 (8)			●	●	●	●	●	●	●
32 / (10)	35	20.7	15 - 20	8 (6) 12 (8)			●	●	●	●	●	●	●
38 / (11)	41	27.7	19 - 27	8 (6) 12 (8)			●	●	●	●	●	●	●
40 / (12)	43	27.7	19 - 27	8 (6) 12 (8)			●	●	●	●	●	●	●
50 / (14)	53	37	26 - 36	8 (6) 12 (8)			●	●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2, starting lead and face surfaces ground.
Special dimensions on request.

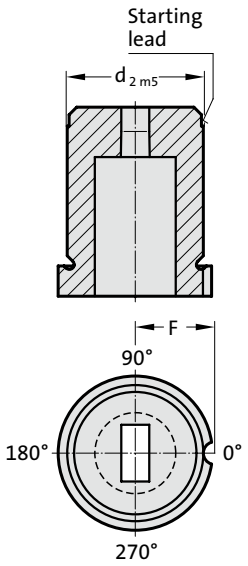
Ordering Code (example): without anti-rotation element

2617.10F8.1510

Shape: round	
P = ø15,1 mm	= 1510
Shape cutting length: l	**Order No**
12 mm	= (8)
Length: l_1	**Order Code character**
28 mm	= (F)
Diameter: d_2	**Order No**
32 mm	= (10)
Type:	**Order No**
with shoulder	
ISO 8977	= (7)
Execution:	**Order No**
round	= (1)
Matrix	= 26

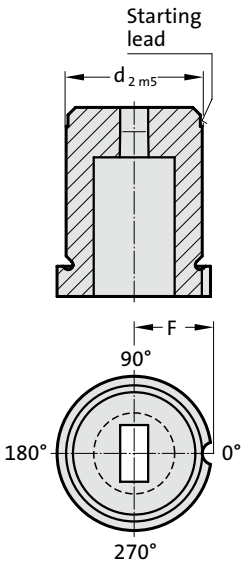
MATRIXES WITH SHOULDER, CYLINDRICAL, ISO 8977, ANTI-ROTATION ELEMENTS

Anti-rotation element 1 (1)



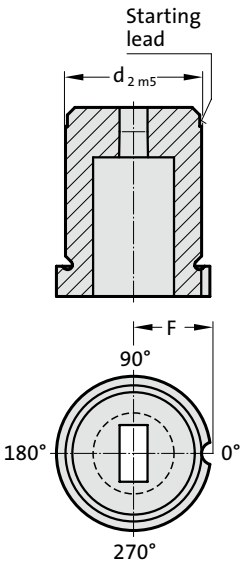
Pin [3	
d_2	F
8	5,5
10	6,5
13	8
16	9,5
20	11,5
22	12,5
25	14
32	17,5
40	21,5
50	26,5

Anti-rotation element 2 (2)



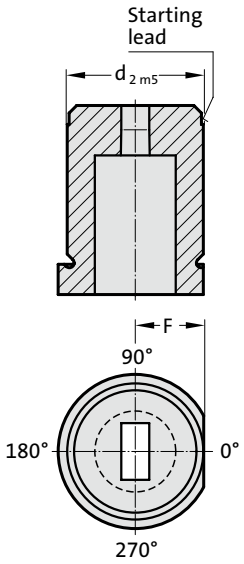
Pin [4	
d_2	F
8	6
10	7
13	8,5
16	10
20	12
22	13
25	14,5
32	18
40	22
50	27

Anti-rotation element 3 (3)



Pin [6	
d_2	F
8	7
10	8
13	9,5
16	11
20	13
22	14
25	15,5
32	19
40	23
50	28

Anti-rotation element 4 (4)



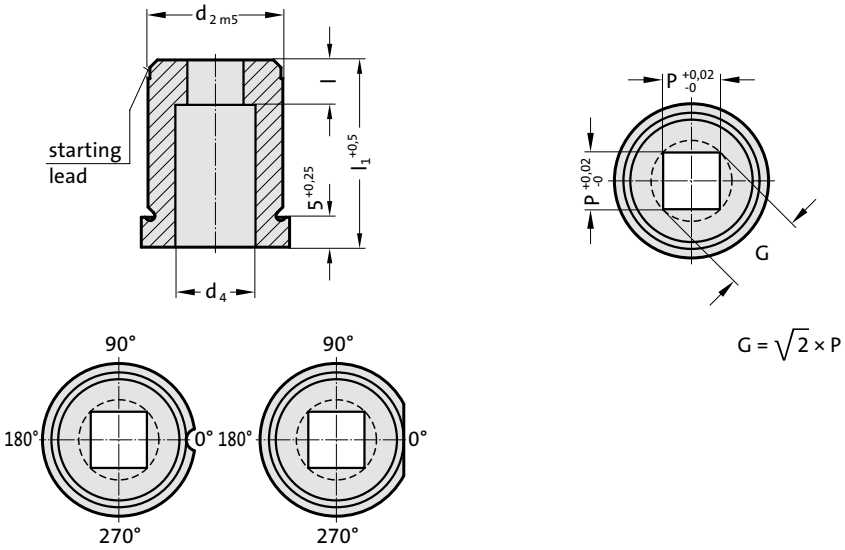
Ordering Code (example): with anti-rotation element from $d_2 \geq 8$ mm

2617.10F8.1510.A4

Anti-rotation element: Polished surface (continuous)	**Order No** = (4)
Angle: 0°	**Order Code character** = (A)
Shape: round P =ø15,1 mm	= 1510
Shape cutting length: l 12 mm	**Order No** = (8)
Length: l_1 28 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (10)
Type: with shoulder ISO 8977	**Order No** = (7)
Execution: round	**Order No** = (1)
Matrix	= 26

MATRIX WITH SHOULDER, SQUARE, ISO 8977

2627.



2627. Matrix with shoulder, square, ISO 8977

d_2 / Order No	d_3	d_4	P_{min}	G_{max}	l / Order No	l_1 / (Order Code character)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)
8 / (3)	11	4	1.2	3.5	4 (3)		●	●	●	●	●	●	●	●
10 / (4)	13	5.8	1.2	5	4 (3) 8 (6)		●	●	●	●	●	●	●	●
13 / (5)	16	8	2	7	5 (4) 8 (6)			●	●	●	●	●	●	●
16 / (6)	19	9.5	2.4	9	5 (4) 8 (6)			●	●	●	●	●	●	●
20 / (7)	23	12	3.2	11	8 (6) 12 (8)			●	●	●	●	●	●	●
22 / (8)	25	15	4	14	8 (6) 12 (8)			●	●	●	●	●	●	●
25 / (9)	28	17.3	4.8	16	8 (6) 12 (8)			●	●	●	●	●	●	●
32 / (10)	35	20.7	5.5	20	8 (6) 12 (8)			●	●	●	●	●	●	●
38 / (11)	41	27.7	6.4	27	8 (6) 12 (8)			●	●	●	●	●	●	●
40 / (12)	43	27.7	6.4	27	8 (6) 12 (8)			●	●	●	●	●	●	●
50 / (14)	53	37	6.4	36	8 (6) 12 (8)			●	●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2, starting lead and face surfaces ground.
Special dimensions on request.

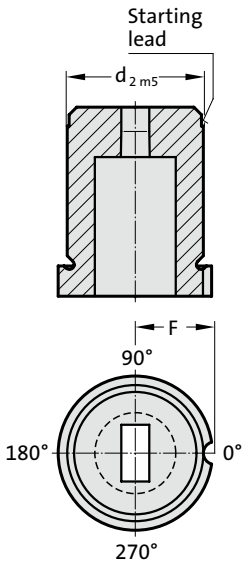
Ordering Code (example): with anti-rotation element

2627.10F8.1350.A3

Anti-rotation element: Pin Ø 6 mm	**Order No** = (3)
Angle: 0°	**Order Code character** = (A)
Shape: square, Length P P = 13,5 mm	= 1350
Shape cutting length: l 12 mm	**Order No** = (8)
Length: l_1 28 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (10)
Type: with shoulder ISO 8977	**Order No** = (7)
Execution: square	**Order No** = (2)
Matrix	= 26

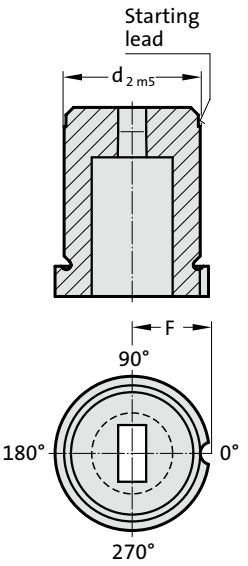
MATRIXES WITH SHOULDER, CYLINDRICAL, ISO 8977, ANTI-ROTATION ELEMENTS

Anti-rotation element 1 (1)



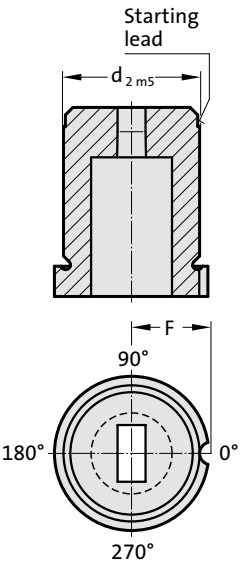
Pin [3	
d_2	F
8	5,5
10	6,5
13	8
16	9,5
20	11,5
22	12,5
25	14
32	17,5
38	20,5
40	21,5
50	26,5

Anti-rotation element 2 (2)



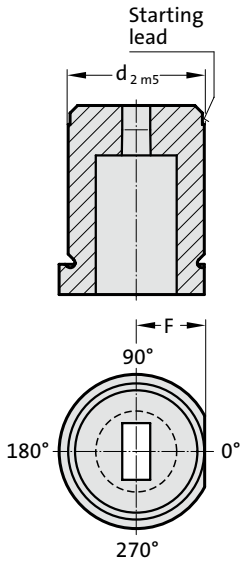
Pin [4	
d_2	F
8	6
10	7
13	8,5
16	10
20	12
22	13
25	14,5
32	18
38	21
40	22
50	27

Anti-rotation element 3 (3)



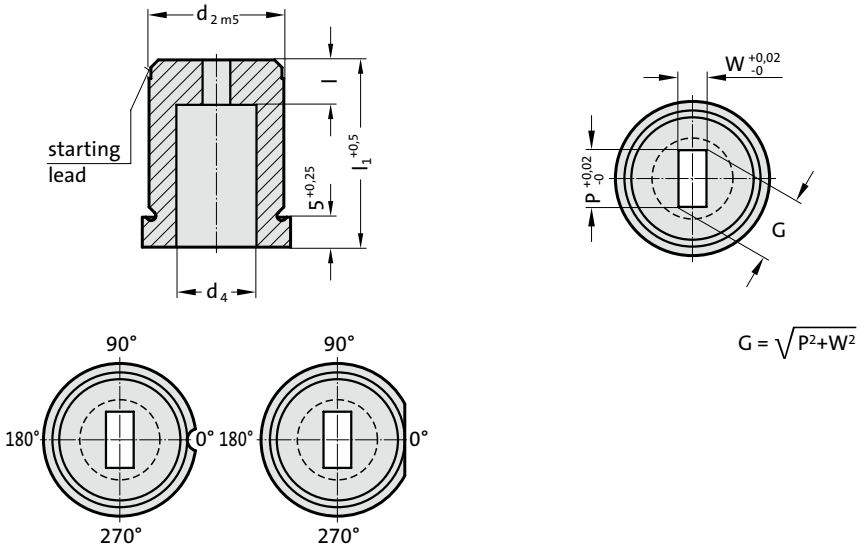
Pin [6	
d_2	F
8	7
10	8
13	9,5
16	11
20	13
22	14
25	15,5
32	19
38	22
40	23
50	28

Anti-rotation element 4 (4)



MATRIX WITH SHOULDER, RECTANGULAR, ISO 8977

2637.



2637. Matrix with shoulder, rectangular, ISO 8977

d_2 / Order No	d_3	d_4	W_{min}	G_{max}	l / Order No	l_1 / (Order Code character)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)
8 / (3)	11	4	1.2	3.5	4 (3)		●	●	●	●	●	●	●	●
10 / (4)	13	5.8	1.2	5	4 (3) 8 (6)		●	●	●	●	●	●	●	●
13 / (5)	16	8	2	7	5 (4) 8 (6)			●	●	●	●	●	●	●
16 / (6)	19	9.5	2.4	9	5 (4) 8 (6)			●	●	●	●	●	●	●
20 / (7)	23	12	3.2	11	8 (6) 12 (8)			●	●	●	●	●	●	●
22 / (8)	25	15	4	14	8 (6) 12 (8)			●	●	●	●	●	●	●
25 / (9)	28	17.3	4.8	16	8 (6) 12 (8)			●	●	●	●	●	●	●
32 / (10)	35	20.7	5.5	20	8 (6) 12 (8)			●	●	●	●	●	●	●
38 / (11)	41	27.7	6.4	27	8 (6) 12 (8)			●	●	●	●	●	●	●
40 / (12)	43	27.7	6.4	27	8 (6) 12 (8)			●	●	●	●	●	●	●
50 / (14)	53	37	6.4	36	8 (6) 12 (8)			●	●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2, starting lead and face surfaces ground.
Special dimensions on request.

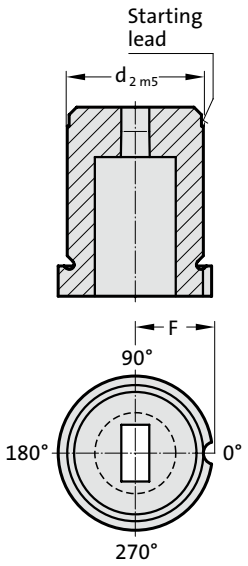
Ordering Code (example): with anti-rotation element

2637.10F8.1350.0650.B2

Anti-rotation element: Pin ⌀ 4 mm	**Order No** = (2)
Angle: 90°	**Order Code character** = (B)
Shape: rectangular, Width W W = 6,5 mm	= 0650
Shape: rectangular, Length P P = 13,5 mm	= 1350
Shape cutting length: l 12 mm	**Order No** = (8)
Length: l_1 28 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (10)
Type: with shoulder ISO 8977	**Order No** = (7)
Execution: rectangular	**Order No** = (3)
Matrix	= 26

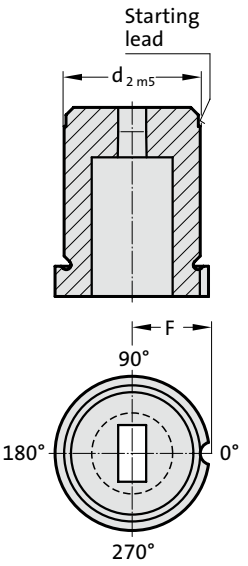
MATRIXES WITH SHOULDER, CYLINDRICAL, ISO 8977, ANTI-ROTATION ELEMENTS

Anti-rotation element 1 (1)



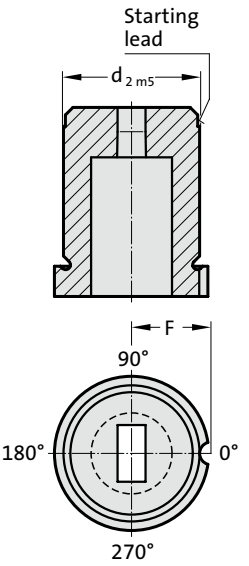
Pin [3	
d_2	F
8	5,5
10	6,5
13	8
16	9,5
20	11,5
22	12,5
25	14
32	17,5
38	20,5
40	21,5
50	26,5

Anti-rotation element 2 (2)



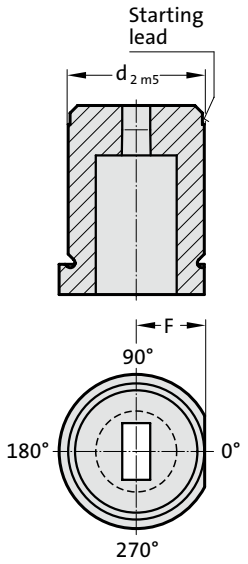
Pin [4	
d_2	F
8	6
10	7
13	8,5
16	10
20	12
22	13
25	14,5
32	18
38	21
40	22
50	27

Anti-rotation element 3 (3)



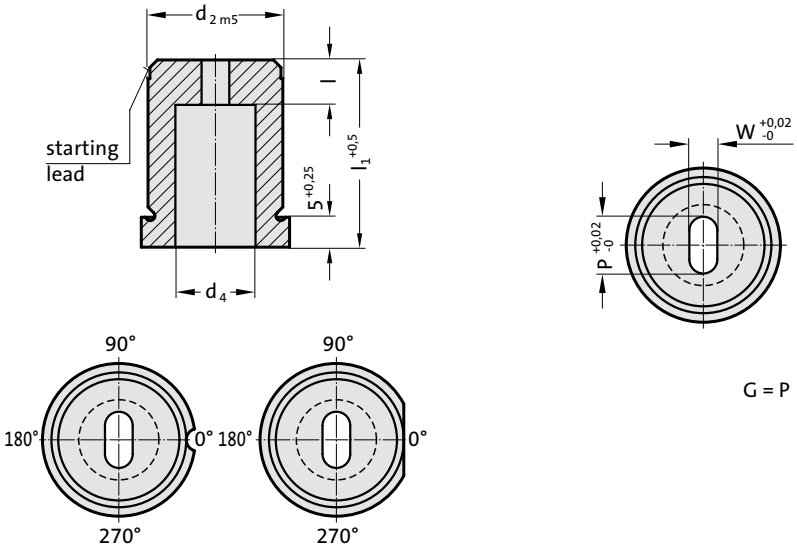
Pin [6	
d_2	F
8	7
10	8
13	9,5
16	11
20	13
22	14
25	15,5
32	19
38	22
40	23
50	28

Anti-rotation element 4 (4)



MATRIX WITH SHOULDER, SLOT, ISO 8977

2647.



2647. Matrix with shoulder, slot, ISO 8977

d_2 / Order No	d_3	d_4	W_{min}	G_{max}	l / Order No	l_1 / (Order Code character)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)
8 / (3)	11	4	1.2	3.5	4 (3)		●	●	●	●	●	●	●	●
10 / (4)	13	5.8	1.2	5	4 (3) 8 (6)		●	●	●	●	●	●	●	●
13 / (5)	16	8	2	7	5 (4) 8 (6)			●	●	●	●	●	●	●
16 / (6)	19	9.5	2.4	9	5 (4) 8 (6)			●	●	●	●	●	●	●
20 / (7)	23	12	3.2	11	8 (6) 12 (8)			●	●	●	●	●	●	●
22 / (8)	25	15	4	14	8 (6) 12 (8)			●	●	●	●	●	●	●
25 / (9)	28	17.3	4.8	16	8 (6) 12 (8)			●	●	●	●	●	●	●
32 / (10)	35	20.7	5.5	20	8 (6) 12 (8)			●	●	●	●	●	●	●
38 / (11)	41	27.7	6.4	27	8 (6) 12 (8)			●	●	●	●	●	●	●
40 / (12)	43	27.7	6.4	27	8 (6) 12 (8)			●	●	●	●	●	●	●
50 / (14)	53	37	6.4	36	8 (6) 12 (8)			●	●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2, starting lead and face surfaces ground.
Special dimensions on request.

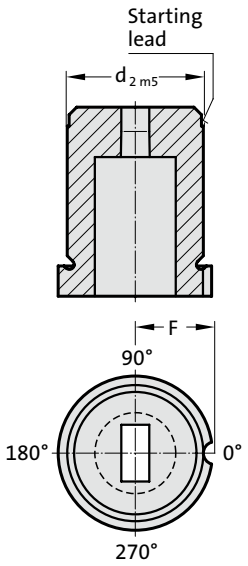
Ordering Code (example): with anti-rotation element

2647.10F8.1350.0650.A3

Anti-rotation element: Pin ⌀ 6 mm	**Order No** = (3)
Angle: 0°	**Order Code character** = (A)
Shape: slot, Width W W = 6,5 mm	= 0650
Shape: slot, Length P P = 13,5 mm	= 1350
Shape cutting length: l 12 mm	**Order No** = (8)
Length: l_1 28 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (10)
Type: with shoulder ISO 8977	**Order No** = (7)
Execution: slot	**Order No** = (4)
Matrix	= 26

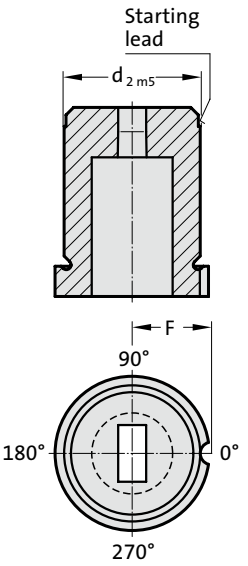
MATRIXES WITH SHOULDER, CYLINDRICAL, ISO 8977, ANTI-ROTATION ELEMENTS

Anti-rotation element 1 (1)



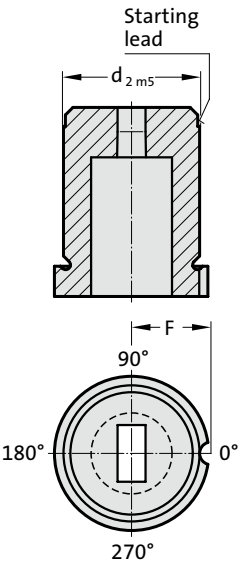
Pin [3	
d_2	F
8	5,5
10	6,5
13	8
16	9,5
20	11,5
22	12,5
25	14
32	17,5
38	20,5
40	21,5
50	26,5

Anti-rotation element 2 (2)



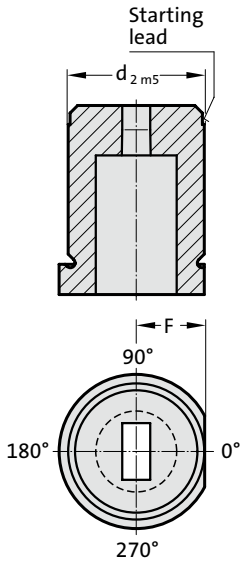
Pin [4	
d_2	F
8	6
10	7
13	8,5
16	10
20	12
22	13
25	14,5
32	18
38	21
40	22
50	27

Anti-rotation element 3 (3)



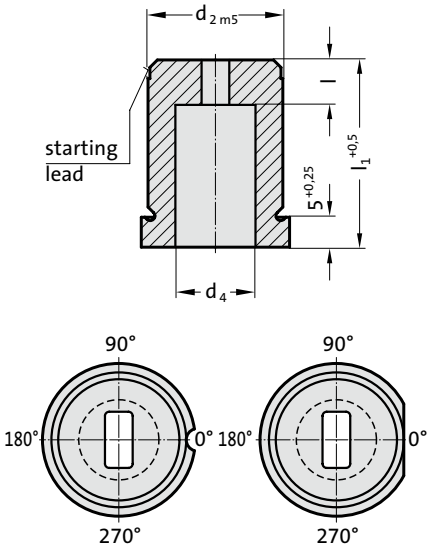
Pin [6	
d_2	F
8	7
10	8
13	9,5
16	11
20	13
22	14
25	15,5
32	19
38	22
40	23
50	28

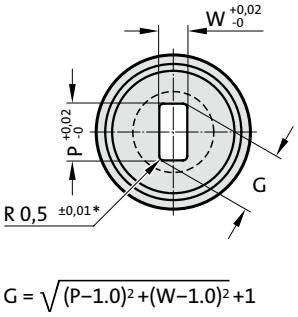
Anti-rotation element 4 (4)



MATRIX WITH SHOULDER, RECTANGLE WITH RADIUSSED CORNERS, ISO 8977

2657.





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

2657. Matrix with shoulder, rectangle with radiussed corners, ISO 8977

d_2 / Order No	d_3	d_4	W_{min}	G_{max}	l / Order No	l_1 / (Order Code character)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)
8 / (3)	11	4	1.2	3.5	4 (3)		●	●	●	●	●	●	●	●
10 / (4)	13	5.8	1.2	5	4 (3) 8 (6)		●	●	●	●	●	●	●	●
13 / (5)	16	8	2	7	5 (4) 8 (6)			●	●	●	●	●	●	●
16 / (6)	19	9.5	2.4	9	5 (4) 8 (6)			●	●	●	●	●	●	●
20 / (7)	23	12	3.2	11	8 (6) 12 (8)			●	●	●	●	●	●	●
22 / (8)	25	15	4	14	8 (6) 12 (8)			●	●	●	●	●	●	●
25 / (9)	28	17.3	4.8	16	8 (6) 12 (8)			●	●	●	●	●	●	●
32 / (10)	35	20.7	5.5	20	8 (6) 12 (8)			●	●	●	●	●	●	●
38 / (11)	41	27.7	6.4	27	8 (6) 12 (8)			●	●	●	●	●	●	●
40 / (12)	43	27.7	6.4	27	8 (6) 12 (8)			●	●	●	●	●	●	●
50 / (14)	53	37	6.4	36	8 (6) 12 (8)			●	●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2, starting lead and face surfaces ground.
Special dimensions on request.
* For other radius options, see standardised special shapes.

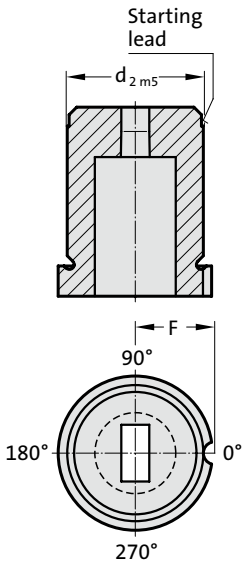
Ordering Code (example): with anti-rotation element

2657.10F8.1350.0650.A1

Anti-rotation element: Pin ⌀ 3 mm	**Order No** = (3)
Angle: 0°	**Order Code character** = (A)
Shape: rectangle with radiused corners, Width W W = 6,5 mm	= 0650
Shape: rectangle with radiused corners, Length P P = 13,5 mm	= 1350
Shape cutting length: l 12 mm	**Order No** = (8)
Length: l_1 28 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (10)
Type: with shoulder ISO 8977	**Order No** = (7)
Execution: rectangle with radiused corners	**Order No** = (5)
Matrix	= 26

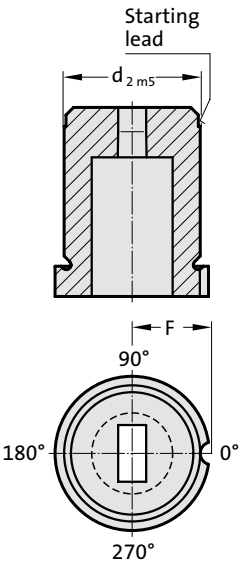
MATRIXES WITH SHOULDER, CYLINDRICAL, ISO 8977, ANTI-ROTATION ELEMENTS

Anti-rotation element 1 (1)



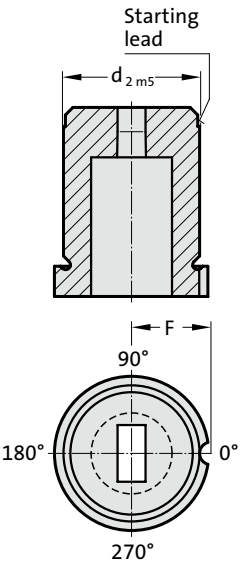
Pin [3	
d_2	F
8	5,5
10	6,5
13	8
16	9,5
20	11,5
22	12,5
25	14
32	17,5
38	20,5
40	21,5
50	26,5

Anti-rotation element 2 (2)



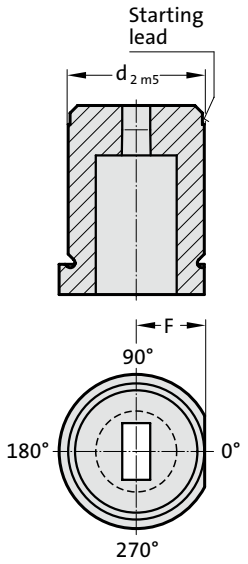
Pin [4	
d_2	F
8	6
10	7
13	8,5
16	10
20	12
22	13
25	14,5
32	18
38	21
40	22
50	27

Anti-rotation element 3 (3)



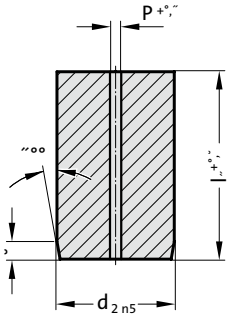
Pin [6	
d_2	F
8	7
10	8
13	9,5
16	11
20	13
22	14
25	15,5
32	19
38	22
40	23
50	28

Anti-rotation element 4 (4)



Matrix without shoulder, blank, Automotive Standard

2605.



2605. Matrix without shoulder, blank, Automotive Standard

d_2 / (Order No)	P	l_1 / (Order Code character)	13 (A)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)
10 / (4)	0.8		●	●	●	●	●	●	●	●	●	
13 / (5)	0.8		●	●	●	●	●	●	●	●	●	
16 / (6)	1.5				●	●	●	●	●	●	●	
20 / (7)	1.5				●	●	●	●	●	●	●	
22 / (8)	1.5				●	●	●	●	●	●	●	
25 / (9)	1.5				●	●	●	●	●	●	●	
32 / (10)	1.5				●	●	●	●	●	●	●	
38 / (11)	1.5				●	●	●	●	●	●	●	●
40 / (12)	1.5					●	●	●	●	●	●	●
45 / (13)	1.5					●	●	●	●	●	●	●
50 / (14)	1.5					●	●	●	●	●	●	●
56 / (15)	1.5					●	●	●	●	●	●	●
63 / (16)	1.5					●	●	●	●	●	●	●
71 / (17)	1.5					●	●	●	●	●	●	●
76 / (18)	1.5						●	●	●	●	●	●
85 / (19)	1.5						●	●	●	●	●	●
90 / (20)	1.5						●	●	●	●	●	●
100 / (21)	1.5						●	●	●	●	●	●

Material:

HSS
Hardness 62 ± 2 HRC

Execution:

Diameter d_2 and face surfaces ground.
Diameter P is a bored pilot hole for wire EDM.
Special dimensions on request.

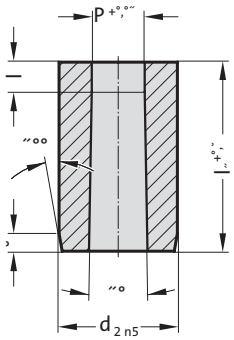
Ordering example:

2 6 0 5 . 10 F

Length: l_1 28 mm		**Order Code character** = (F)
Diameter: d_2 32 mm		**Order No** = (10)
Type: without shoulder Automotive Standard		**Order No** = (5)
Version: Blank (pilot hole bore)		**Order No** = (0)
Matrix		= 26

MATRIX WITHOUT SHOULDER, ROUND, AUTOMOTIVE STANDARD

2615.



2615. Matrix without shoulder, round, Automotive Standard

d_2 / Order No	P	l_1 / (Order Code character)	13 (A)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)
10 / (4)	1,6 - 6,8		●	●	●	●	●	●	●	●	●	
13 / (5)	3 - 8,8		●	●	●	●	●	●	●	●	●	
16 / (6)	7,4 - 10,8				●	●	●	●	●	●	●	
20 / (7)	9,5 - 13,6				●	●	●	●	●	●	●	
22 / (8)	10,5 - 15				●	●	●	●	●	●	●	
25 / (9)	12 - 17				●	●	●	●	●	●	●	
32 / (10)	16 - 22				●	●	●	●	●	●	●	
38 / (11)	18 - 27				●	●	●	●	●	●	●	●
40 / (12)	18 - 27					●	●	●	●	●	●	●
45 / (13)	18 - 35					●	●	●	●	●	●	●
50 / (14)	18 - 40					●	●	●	●	●	●	●
56 / (15)	18 - 45					●	●	●	●	●	●	●
63 / (16)	18 - 50					●	●	●	●	●	●	●
71 / (17)	18 - 56					●	●	●	●	●	●	●
76 / (18)	25 - 60						●	●	●	●	●	●
85 / (19)	25 - 66						●	●	●	●	●	●
90 / (20)	32 - 70						●	●	●	●	●	●
100 / (21)	32 - 78						●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

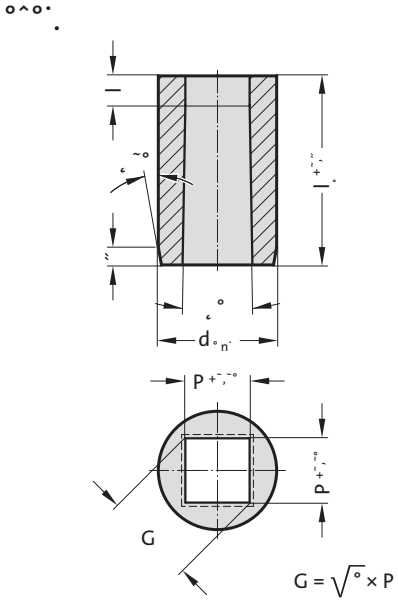
Execution:
Diameter d_2 and end faces ground.
Special dimensions on request.

Ordering Code (example): without / with anti-rotation element

2615.10F8.2190/ .A3

Anti-rotation element: Pin Ø 6 mm	**Order No** = (3)
Angle: 0°	**Order Code character** = (A)
Shape: round P = Ø 21,9 mm	= (2190)
Shape cutting length: l 12 mm	**Order No** = (8)
Length: l_1 28 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (10)
Type: without shoulder Automotive Standard	**Order No** = (5)
Execution: round	**Order No** = (1)
Matrix	= 26

MATRIX WITHOUT SHOULDER, SQUARE, AUTOMOTIVE STANDARD



2625. Matrix without shoulder, square, Automotive Standard

d_2 / Order No	P_{min}	G_{max}	l / Order No	l_1 / (Order Code character)	13 (A)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)
10 / (4)	1.3	6.8	3 (2) 4 (3) 5 (4)		●	●	●	●	●	●	●	●	●	
13 / (5)	1.9	8.8	3 (2) 5 (4) 8 (6)		●	●	●	●	●	●	●	●	●	
16 / (6)	1.9	10.8	3 (2) 5 (4) 8 (6)				●	●	●	●	●	●	●	
20 / (7)	1.9	13.6	3 (2) 6 (5) 10 (7)				●	●	●	●	●	●	●	
22 / (8)	1.9	15	3 (2) 6 (5) 10 (7)				●	●	●	●	●	●	●	
25 / (9)	1.9	17	3 (2) 6 (5) 10 (7)				●	●	●	●	●	●	●	
32 / (10)	1.9	22	3 (2) 6 (5) 12 (8)				●	●	●	●	●	●	●	
38 / (11)	1.9	27	3 (2) 8 (6) 12 (8)				●	●	●	●	●	●	●	●
40 / (12)	1.9	27	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
45 / (13)	2.4	35	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
50 / (14)	4	40	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
56 / (15)	4	45	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
63 / (16)	4	50	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
71 / (17)	4	56	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
76 / (18)	5.6	60	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●
85 / (19)	5.6	66	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●
90 / (20)	5.6	70	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●
100 / (21)	5.6	78	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2 and end faces ground.
Special dimensions on request.

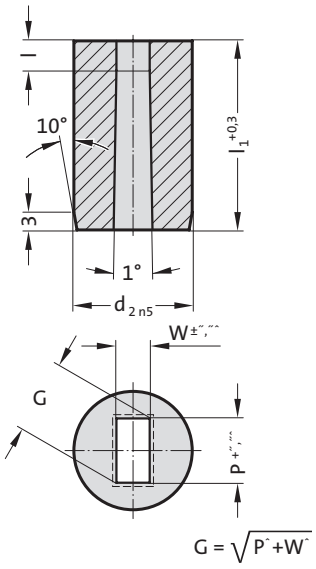
Ordering Code (example): with anti-rotation element

2 6 2 5 . 10 F 8 . 1350 . A 3

Anti-rotation element: Pin Ø 6 mm	**Order No** = (3)
Angle: 0°	**Order Code character** = (A)
Shape: square, Length P P = 13,5 mm	= (1350)
Shape cutting length: l 12 mm	**Order No** = (8)
Length: l_1 28 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (10)
Type: without shoulder Automotive Standard	**Order No** = (5)
Execution: square	**Order No** = (2)
Matrix	= 26

MATRIX WITHOUT SHOULDER, RECTANGULAR, AUTOMOTIVE STANDARD

2635.



2635. Matrix without shoulder, rectangular, Automotive Standard

d_2 / Order No	W_{min}	G_{max}	l / Order No	l_1 / (Order Code character)	13 (A)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)
10 / (4)	1.3	6.8	3 (2) 4 (3) 5 (4)		●	●	●	●	●	●	●	●	●	
13 / (5)	1.9	8.8	3 (2) 5 (4) 8 (6)		●	●	●	●	●	●	●	●	●	
16 / (6)	1.9	10.8	3 (2) 5 (4) 8 (6)				●	●	●	●	●	●	●	
20 / (7)	1.9	13.6	3 (2) 6				●	●	●	●	●	●	●	
22 / (8)	1.9	15	3 (2) 6 (5) 10 (7)				●	●	●	●	●	●	●	
25 / (9)	1.9	17	3 (2) 6 (5) 10 (7)				●	●	●	●	●	●	●	
32 / (10)	1.9	22	3 (2) 6 (5) 12 (8)				●	●	●	●	●	●	●	
38 / (11)	1.9	27	3 (2) 8 (6) 12 (8)				●	●	●	●	●	●	●	●
40 / (12)	1.9	27	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
45 / (13)	2.4	35	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
50 / (14)	4	40	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
56 / (15)	4	45	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
63 / (16)	4	50	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
71 / (17)	4	56	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
76 / (18)	5.6	60	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●
85 / (19)	5.6	66	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●
90 / (20)	5.6	70	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●
100 / (21)	5.6	78	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2 and end faces ground.
Special dimensions on request.

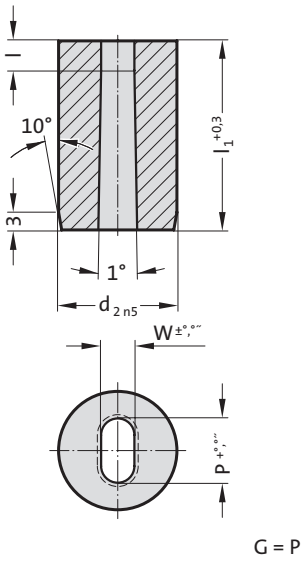
Ordering Code (example): with anti-rotation element

2635.10F8.1350.0650.A3_

Anti-rotation element: Pin Ø 6 mm	**Order No** = (3)
Angle: 0°	**Order Code character** = (A)
Shape: rectangular, Width W W = 6,5 mm	= (0650)
Shape: rectangular, Length P P = 13,5 mm	= (1350)
Shape cutting length: l 12 mm	**Order No** = (8)
Length: l_1 28 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (10)
Type: without shoulder Automotive Standard	**Order No** = (5)
Execution: rectangular	**Order No** = (3)
Matrix	= 26

MATRIX WITHOUT SHOULDER, SLOT, AUTOMOTIVE STANDARD

2645.



G = P

2645. Matrix without shoulder, slot, Automotive Standard

d_2 / Order No	W_{min}	G_{max}	l / Order No	l_1 / (Order Code character)	13 (A)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)
10 / (4)	1.3	6.8	3 (2) 4 (3) 5 (4)		●	●	●	●	●	●	●	●	●	
13 / (5)	1.9	8.8	3 (2) 5 (4) 8 (6)		●	●	●	●	●	●	●	●	●	
16 / (6)	1.9	10.8	3 (2) 5 (4) 8 (6)				●	●	●	●	●	●	●	
20 / (7)	1.9	13.6	3 (2) 6				●	●	●	●	●	●	●	
22 / (8)	1.9	15	3 (2) 6 (5) 10 (7)				●	●	●	●	●	●	●	
25 / (9)	1.9	17	3 (2) 6 (5) 10 (7)				●	●	●	●	●	●	●	
32 / (10)	1.9	22	3 (2) 6 (5) 12 (8)				●	●	●	●	●	●	●	
38 / (11)	1.9	27	3 (2) 8 (6) 12 (8)				●	●	●	●	●	●	●	●
40 / (12)	1.9	27	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
45 / (13)	2.4	35	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
50 / (14)	4	40	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
56 / (15)	4	45	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
63 / (16)	4	50	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
71 / (17)	4	56	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
76 / (18)	5.6	60	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●
85 / (19)	5.6	66	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●
90 / (20)	5.6	70	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●
100 / (21)	5.6	78	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2 and end faces ground.
Special dimensions on request.

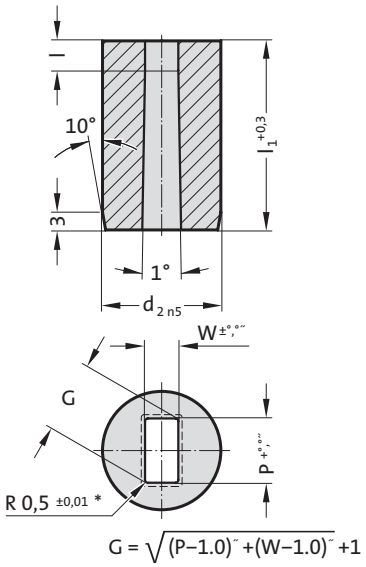
Ordering Code (example): with anti-rotation element

2645.10F8.1350.0650.A3_

Anti-rotation element: Pin Ø 6 mm	**Order No** = (3)
Angle: 0°	**Order Code character** = (A)
Shape: slot, Width W W = 6,5 mm	= (0650)
Shape: slot, Length P P = 13,5 mm	= (1350)
Shape cutting length: l 12 mm	**Order No** = (8)
Length: l_1 28 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (10)
Type: without shoulder Automotive Standard	**Order No** = (5)
Execution: slot	**Order No** = (4)
Matrix	= 26

MATRIX WITHOUT SHOULDER, RECTANGLE WITH RADIUSED CORNERS, AUTOMOTIVE STANDARD

2655.



2655. Matrix without shoulder, rectangle with radiused corners, Automotive Standard

d_2 / Order No	W_{min}	G_{max}	l / Order No	l_1 / (Order Code character)	13 (A)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)
10 / (4)	1.3	6.8	3 (2) 4 (3) 5 (4)		●	●	●	●	●	●	●	●	●	
13 / (5)	1.9	8.8	3 (2) 5 (4) 8 (6)		●	●	●	●	●	●	●	●	●	
16 / (6)	1.9	10.8	3 (2) 5 (4) 8 (6)				●	●	●	●	●	●	●	
20 / (7)	1.9	13.6	3 (2) 6				●	●	●	●	●	●	●	
22 / (8)	1.9	15	3 (2) 6 (5) 10 (7)				●	●	●	●	●	●	●	
25 / (9)	1.9	17	3 (2) 6 (5) 10 (7)				●	●	●	●	●	●	●	
32 / (10)	1.9	22	3 (2) 6 (5) 12 (8)				●	●	●	●	●	●	●	
38 / (11)	1.9	27	3 (2) 8 (6) 12 (8)				●	●	●	●	●	●	●	●
40 / (12)	1.9	27	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
45 / (13)	2.4	35	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
50 / (14)	4	40	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
56 / (15)	4	45	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
63 / (16)	4	50	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
71 / (17)	4	56	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
76 / (18)	5.6	60	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●
85 / (19)	5.6	66	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●
90 / (20)	5.6	70	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●
100 / (21)	5.6	78	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2 and end faces ground.
Special dimensions on request.
* For other radius options, see standardised special shapes.

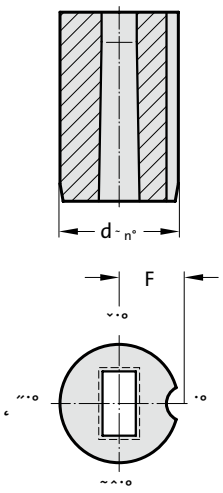
Ordering Code (example): with anti-rotation element

2655.10F8.1350.0650.A3_

Anti-rotation element:	**Order No**
Pin Ø 6 mm	= (3)
Angle:	**Order Code character**
0°	= (A)
Shape: rectangle with radiused corners, Width W	
W = 6,5 mm	= (0650)
Shape: rectangle with radiused corners, Length P	
P = 13,5 mm	= (1350)
Shape cutting length: l	**Order No**
12 mm	= (8)
Length: l_1	**Order Code character**
28 mm	= (F)
Diameter: d_2	**Order No**
32 mm	= (10)
Type: without shoulder	**Order No**
Automotive Standard	= (5)
Execution:	**Order No**
rectangle with radiused corners	= (5)
Matrixes:	
Matrixes	= 26

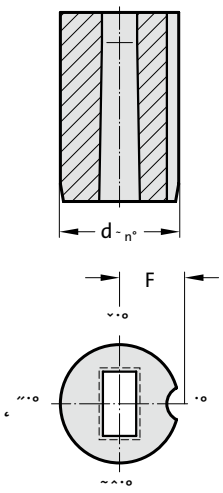
MATRIX WITHOUT SHOULDER, AUTOMOTIVE STANDARD, ANTI-ROTATION ELEMENTS

Anti-rotation element 1 (1)



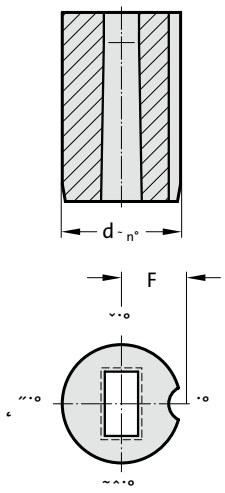
	pin ∅3
d_2	F
10	5
13	6,5
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
45	22,5
50	25
56	28
63	31,5
71	35,5
76	38
85	42,5
90	45
100	50

Anti-rotation element 2 (2)



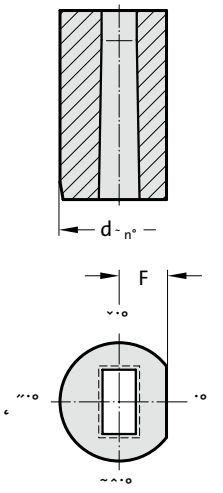
	pin ∅4
d_2	F
10	6
13	7,2
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
45	22,5
50	25
56	28
63	31,5
71	35,5
76	38
85	42,5
90	45
100	50

Anti-rotation element 3 (3)



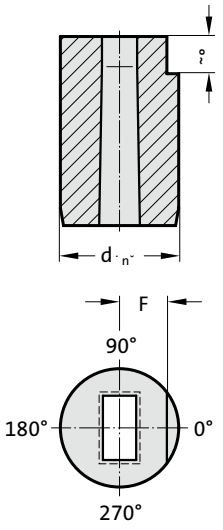
	pin ∅6
d_2	F
10	7
13	8,2
16	9
20	11
22	12
25	13,5
32	16
38	19
40	20
45	22,5
50	25
56	28
63	31,5
71	35,5
76	38
85	42,5
90	45
100	50

Anti-rotation element 4 (4)



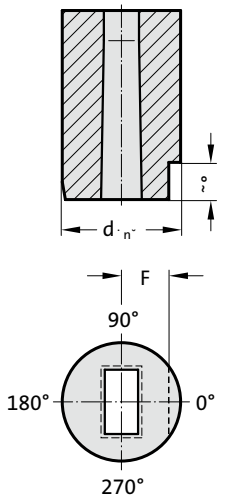
d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
45	20,5
50	23
56	26
63	29,5
71	33,5
76	35,5
85	40
90	42,5
100	47,5

Anti-rotation element 5 (5)



d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
45	20,5
50	23
56	26
63	29,5
71	33,5
76	35,5
85	40
90	42,5
100	47,5

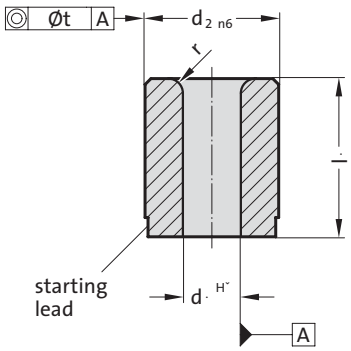
Anti-rotation element 6 (6)



d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
45	20,5
50	23
56	26
63	29,5
71	33,5
76	35,5
85	40
90	42,5
100	47,5

Guide bush for punch DIN 9845, Shape C

262.



262. Guide bush for punch DIN 9845, Shape C

	Gradation				
d_1	d_1	d_2	t	l_1	r
0.5 - 1	0.1	5	0.01	9	1
1.1 - 2	0.1	6	0.01	12	1
2.1 - 3	0.1	7	0.01	12	1
3.1 - 4	0.1	8	0.01	12	1
4.1 - 5	0.1	10	0.01	16	1
5.1 - 6	0.1	12	0.02	16	1.5
6.1 - 8	0.1	15	0.02	20	1.5
8.1 - 10	0.1	18	0.02	20	2
10.1 - 12	0.1	22	0.02	28	2
12.1 - 15	0.1	26	0.02	28	2
15.1 - 18	0.5	30	0.02	36	2

Material:

Case hardened steel
Hardness 740 ± 40 HV 10

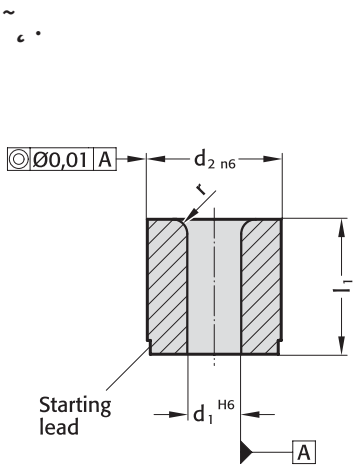
Execution:

Diameters d_1, d_2 and starting lead ground.

Ordering Code (example):

Guide bush for punch DIN 9845, Shape C		=262.1.		
Guide diameter d_1	0.5 mm	=	0050.	
Length l_1	9 mm	=		009
Order No		=262.1.	0050.	009

Guide bush for punch ISO 8978



Material:

WS
Hardness 60 ± 2 HRC

Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

Diameters d_1, d_2 and starting lead ground.

2621. Guide bush for punch ISO 8978

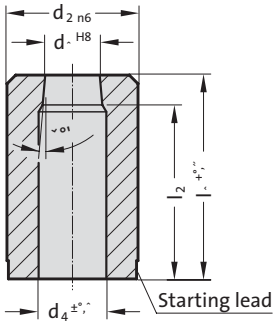
	Gradation			
d_1	d_1	d_2	l_1	r
1 - 2.4	0.1	5	8	1
1.6 - 3	0.1	6	12.5	1
2 - 3.5	0.1	8	12.5	1.5
3 - 5	0.1	10	16	2
4 - 7.2	0.1	13	16	2
6 - 8.8	0.1	16	20	2
7.5 - 11.3	0.1	20	20	2.5
11 - 16.6	0.1	25	25	2.5
15 - 20	0.5	32	25	4
18 - 27	0.5	40	32	4
26 - 36	0.5	50	40	4

Ordering Code (example):

Guide bush for punch ISO 8978		=	2621.1.		
Guide diameter d_1	1 mm	=		0100.	
External diameter d_2	5 mm	=			0500
Order No		=	2621.1.	0100.	0500

Matrix without collar, DIN 9845 Shape A

260.



260. Matrix without collar, DIN 9845 Shape A

d_1	Gradation d_1	d_2	l_2 l_1=20	l_2 l_1=28
0.5 - 1	0.1	5	18	
1.1 - 2	0.1	6	17	25
2.1 - 3	0.1	7	17	25
3.1 - 4	0.1	8	17	25
4.1 - 5	0.1	10	16	24
5.1 - 6	0.1	12	16	24
6.1 - 8	0.1	15	16	24
8.1 - 10	0.1	18	16	24
10.1 - 12	0.1	22	15	23
12.1 - 15	0.1	26	15	23
15.1 - 18	0.1	30		23

Material:

HSS
Order No 260.3.
Hardness 62 ± 2 HRC

Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

Diameters d_1, d_2 and face surfaces ground.

d_4: For $d_1 \leq 2$ mm, $d_4 = d_1 + 0{,}3$
For d_1 = 2,1 mm to 4,0 mm, $d_4 = d_1 + 0{,}5$
For d_1 = 4,1 mm to 8,0 mm, $d_4 = d_1 + 0{,}7$
For $d_1 \geq 8{,}1$ mm, $d_4 = d_1 + 1$

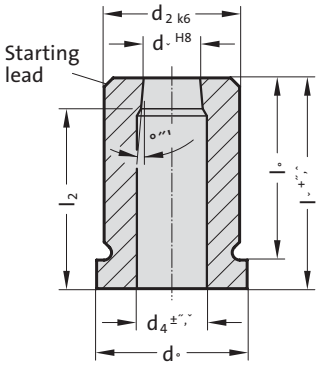
Other diameters on request.

Ordering Code (example):

Matrix without collar, DIN 9845 Shape A		=260.3.		
Cutting diameter d_1	0.5 mm	=	0050.	
Length l_1	20 mm	=		020
Order No		=260.3.	0050.	020

Matrix with collar, DIN 9845 Shape B

261.



Material:

HSS
Order No 261.3.
Hardness 62 ± 2 HRC

Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

Diameters d_1, d_2 and face surfaces ground.

d_4: For $d_1 \leq 2$ mm, $d_4 = d_1 + 0{,}3$
For d_1 = 2,1 mm to 4,0 mm, $d_4 = d_1 + 0{,}5$
For d_1 = 4,1 mm to 8,0 mm, $d_4 = d_1 + 0{,}7$
For $d_1 \geq 8{,}1$ mm, $d_4 = d_1 + 1$

Other diameters on request.

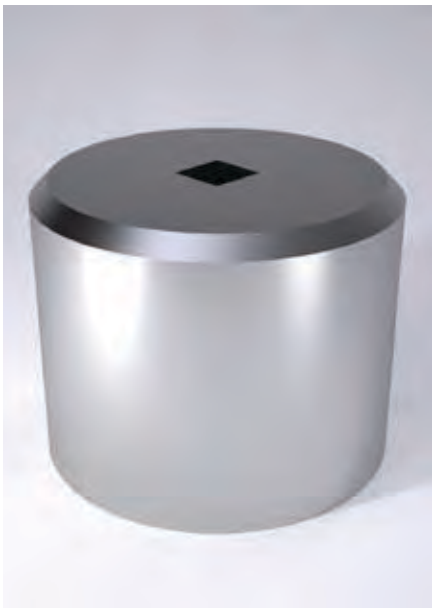
261. Matrix with collar, DIN 9845 Shape B

d_1	Gradation d_1	d_2	d_3	l_2	l_3	l_2	l_3
				l_1=20	l_1=20	l_1=28	l_1=28
0.5 - 1	0.1	5	7	18	16		
1.1 - 2	0.1	6	8	17	16	25	24
2.1 - 3	0.1	7	9	17	16	25	24
3.1 - 4	0.1	8	10	17	16	25	24
4.1 - 5	0.1	10	12	16	16	24	24
5.1 - 6	0.1	12	14	16	16	24	24
6.1 - 8	0.1	15	17	16	16	24	24
8.1 - 10	0.1	18	20	16	16	24	24
10.1 - 12	0.1	22	24	15	16	23	24
12.1 - 15	0.1	26	28	15	16	23	24
15.1 - 18	0.1	30	32			23	24

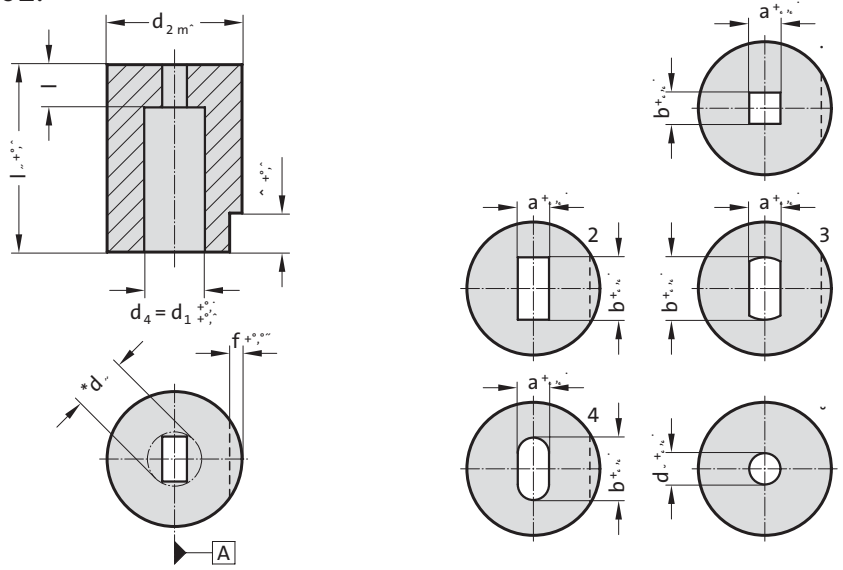
Ordering Code (example):

Matrix with collar, DIN 9845 Shape B		=261.3.		
Cutting diameter d_1	0.5 mm	=	0050.	
Length l_1	20 mm	=		020
Order No		=261.3.	0050.	020

Matrix without collar, cylindrical



2602.



2602. Matrix without collar, cylindrical

d_1 , d_5	d_2	l	f	l_1	l_1	l_1	l_1	l_1	l_1
				16	19	22	25	28	32
1.8 - 3.2	8	3	1	●	●	●	●	●	●
2 - 5	10	3	1	●	●	●	●	●	●
3 - 7	13	3	1.5	●	●	●	●	●	●
5 - 8	16	5	1.5	●	●	●	●	●	●
7 - 11	20	5	1.5	●	●	●	●	●	●
11 - 16	25	5	2.5	●	●	●	●	●	●
16 - 19	32	7	2.5	●	●	●	●	●	●
19 - 28	40	7	2.5	●	●	●	●	●	●

Material:

HSS
Order No. 2602.3.
Hardness 64 ± 2 HRC

Execution:

Diameter d_2 and end faces ground.
Key flats parallel with reference axis “A” unless otherwise specified.
*d_1 = size over corners

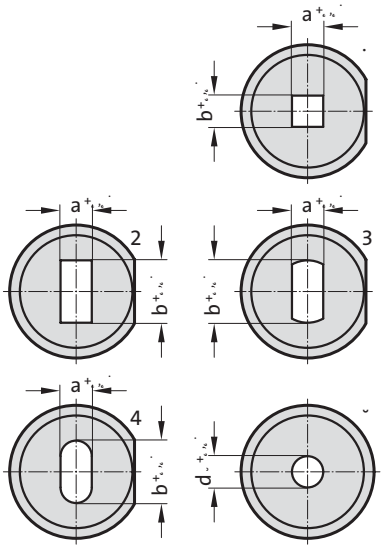
With starting holes for wire-EDM as per 2601.

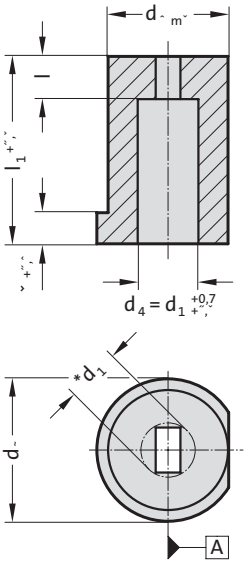
Ordering Code (example):

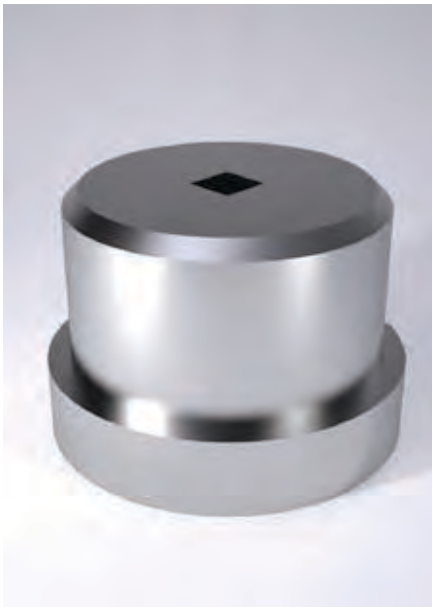
Matrix without collar, cylindrical		=	2602.3.						
Locating diameter d_2	8 mm	=		008.					
Length l_1	16 mm	=			016.				
Die shape Shape	Square	=				1.			
Width of die shape a	1.2 mm	=					0120.		
Die shape length b	1.2 mm	=						0120	
Order No		=	2602.3.	008.	016.	1.	0120.	0120	

Matrix with collar, cylindrical

2612.







Material:

HSS
Order No. 2612.3.
Hardness 64 ± 2 HRC

Execution:

Diameter d_2 and end faces ground.
Key flats parallel with reference axis “A” unless otherwise specified.
*d_1 = size over corners

With starting holes for wire-EDM as per 2611.

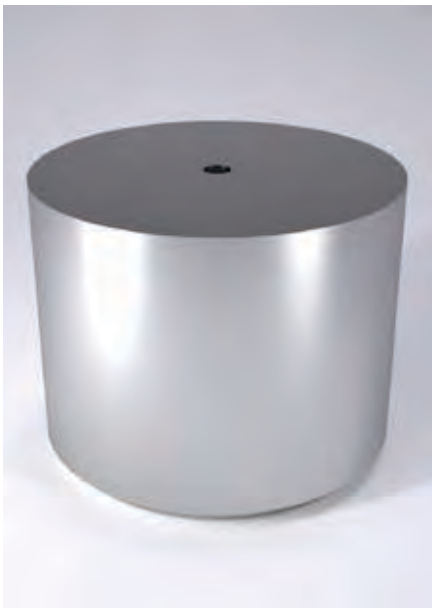
2612. Matrix with collar, cylindrical

d_1 , d_5	d_2	d_3	l	F	l_1 16	l_1 19	l_1 22	l_1 25	l_1 28	l_1 32
1.8 - 3.2	8	11	3	1	●	●	●	●	●	●
2 - 5	10	13	3	1	●	●	●	●	●	●
3 - 7	13	16	3	1.5	●	●	●	●	●	●
5 - 8	16	19	5	1.5	●	●	●	●	●	●
7 - 11	20	23	5	1.5	●	●	●	●	●	●
11 - 16	25	28	5	2.5	●	●	●	●	●	●
16 - 19	32	35	7	2.5	●	●	●	●	●	●
19 - 28	40	43	7	2.5	●	●	●	●	●	●

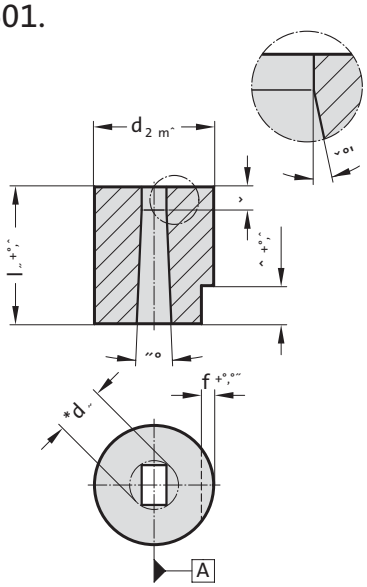
Ordering Code (example):

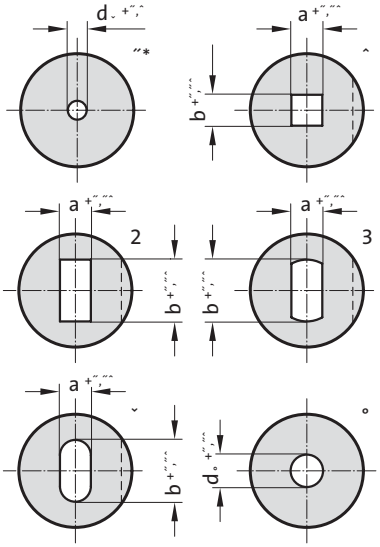
Matrix with collar, cylindrical		=	2612.3.					
Locating diameter d_2	8 mm	=		008.				
Length l_1	16 mm	=			016.			
Die shape Shape	Square	=				1.		
Width of die shape a	1.2 mm	=					0120.	
Die shape length b	1.2 mm	=						0120
Order No		=	2612.3.	008.	016.	1.	0120.	0120

Matrix without collar, conical



2601.





2601. Matrix without collar, conical

d_1 , d_5	d_2	d_4	f	l_1	l_1	l_1	l_1	l_1	l_1
				16	19	22	25	28	32
1.6 - 3.2	8	1	1	●	●	●	●	●	●
2 - 5	10	1	1	●	●	●	●	●	●
3 - 7	13	1.5	1.5	●	●	●	●	●	●
5 - 8	16	1.5	1.5	●	●	●	●	●	●
7 - 11	20	1.5	1.5	●	●	●	●	●	●
11 - 16	25	2.5	2.5	●	●	●	●	●	●
16 - 19	32	2.5	2.5	●	●	●	●	●	●
19 - 28	40	2.5	2.5	●	●	●	●	●	●

Material:

HSS
Order No. 2601.3.
Hardness 64 ± 2 HRC

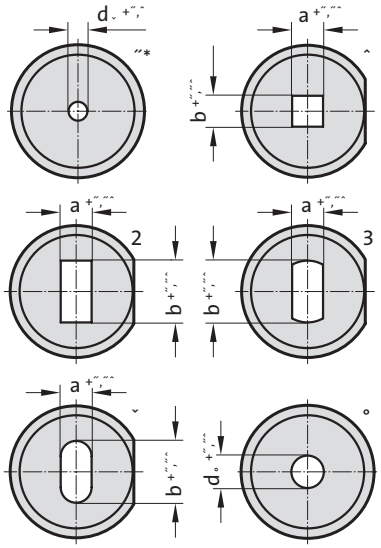
Execution:

Diameter d_2 and end faces ground.
Key flats parallel with reference axis “A” unless otherwise specified.
*d_1 = size over corners
*0 = Execution only with starting hole for wire-EDM

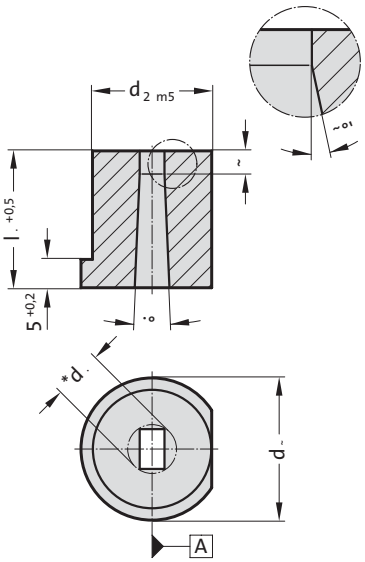
Ordering Code (example):

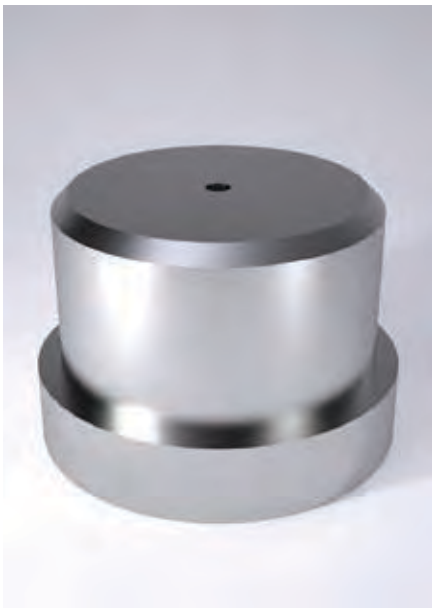
Matrix without collar, conical		=	2601.3.					
Locating diameter d_2	8 mm	=		008.				
Length l_1	16 mm	=			016.			
Die shape Shape	Square	=				1.		
Width of die shape a	1.2 mm	=					0120.	
Die shape length b	1.2 mm	=						0120
Order No		=	2601.3.	008.	016.	1.	0120.	0120

Matrix with collar, conical



2611.





Material:

HSS
Order No. 2611.3.
Hardness 64 ± 2 HRC

Execution:

Diameter d_2 and end faces ground.
Key flats parallel with reference axis “A” unless otherwise specified.
*d_1 = size over corners
*0 = Execution only with starting hole for wire-EDM

2611. Matrix with collar, conical

d_1 , d_5	d_2	d_3	d_4	l_1	l_1	l_1	l_1	l_1	l_1
				16	19	22	25	28	32
1.6 - 3.2	8	11	1	●	●	●	●	●	●
2 - 5	10	13	1	●	●	●	●	●	●
3 - 7	13	16	1.5	●	●	●	●	●	●
5 - 8	16	19	1.5	●	●	●	●	●	●
7 - 11	20	23	1.5	●	●	●	●	●	●
11 - 16	25	28	2.5	●	●	●	●	●	●
16 - 19	32	35	2.5	●	●	●	●	●	●
19 - 28	40	43	2.5	●	●	●	●	●	●

Ordering Code (example):

Matrix with collar, conical		=	2611.3.					
Locating diameter d_2	8 mm	=		008.				
Length l_1	16 mm	=			016.			
Die shape Shape	Square	=				1.		
Width of die shape a	1.2 mm	=					0120.	
Die shape length b	1.2 mm	=						0120
Order No		=	2611.3.	008.	016.	1.	0120.	0120

Standardised Special Shapes

Ordering examples
Special shapes Punches/Matrixes (standardised)

2 2 9 1 . ___ . F 4 4 . . .

Punch:
22 without ejector pin

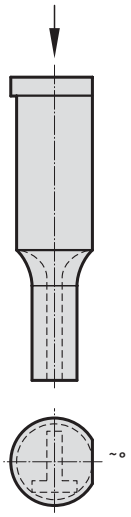
Special shape

Type:	Order No
ISO 8020	= 1
ball-lock, light duty	= 2
ball-lock, heavy duty	= 3
ball-lock, larger cutting edge, light duty	= 4
ball-lock, larger cutting edge, heavy duty	= 5

You will find diameters and lengths on the pages of punches you have selected.

NB:
All the parameters must be given for special shapes!

Special shape F 44



2 6 9 6 . ___ . F 4 4 . . .

Matrixes

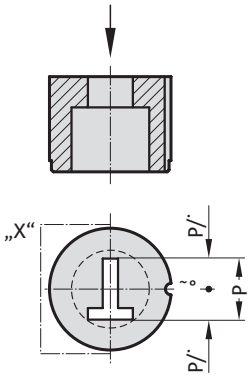
Special shape

Type:	Order No
automotive	= 5
without shoulder ISO 8977	= 6
with shoulder ISO 8977	= 7

You will find diameters and lengths on the pages of cutting bushes you have selected.

NB:
All the parameters must be given for special shapes!

Special shape F 44



Cutting gap (a)

Roundings with the corresponding sharp corners reduce the cutting gap per side (a). If the cutting gap is 0.04 mm (a) or less, FIBRO will round the sharp edges if the cutting punch and the matrixes are ordered together. This reduces the installation time and the risk of an edge breaking during operation.

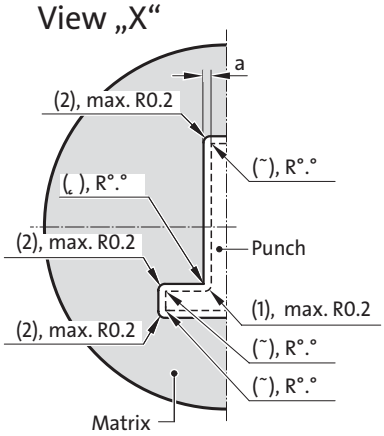
Note:

(1) and (2) - r oundings and sharp edges

(1) rounding on the cutting punch of max. R0.2, corresponds to a sharp edge on the matrix

(2) rounding on the cutting matrix of max. R0.2, corresponds to a sharp edge on the punch

View „X“

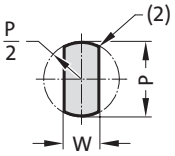


Standardised special shapes

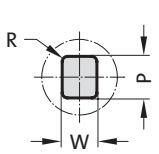
90°

Round, flattened

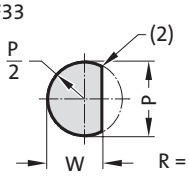
F10



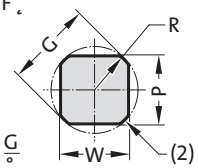
F˘˘



F33

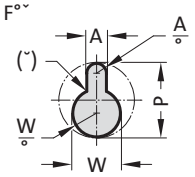


F˙˛

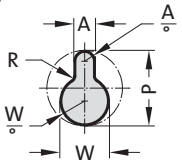


Key-hole shapes

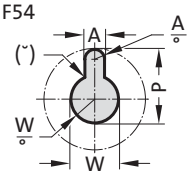
F°˘



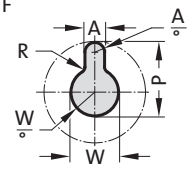
F˙˘



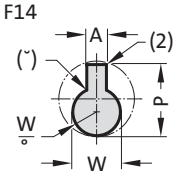
F54



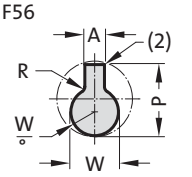
F¨



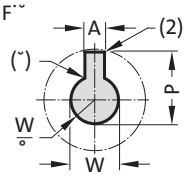
F14



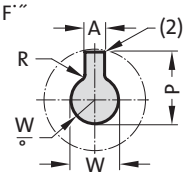
F56



F˙˘

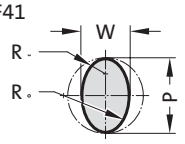


F˙˝

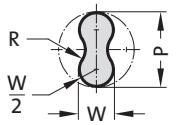


Various

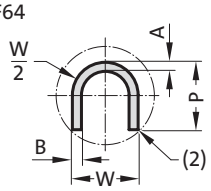
F41



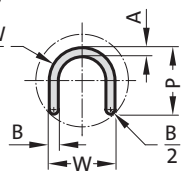
F˄˘



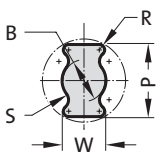
F64



F65



F˛˘



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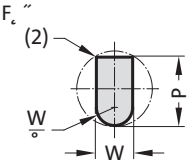
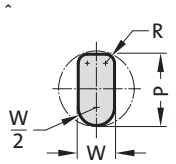
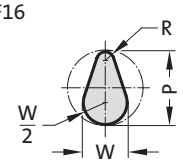


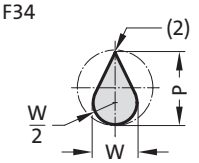
F˛˄



F16



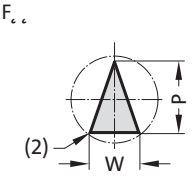
F34



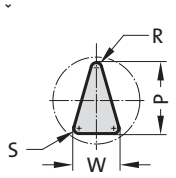
180°

Triangles, trapezes

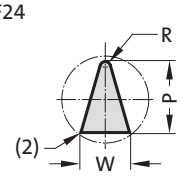
F˛˛



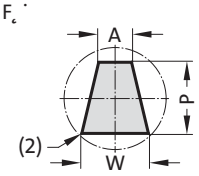
F˛˘



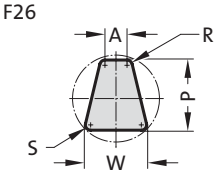
F24



F˛˙

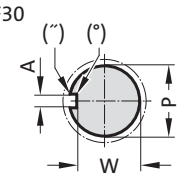


F26

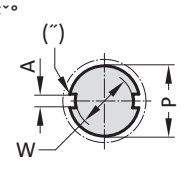


Key-hole

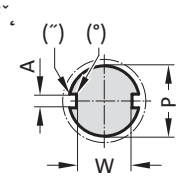
F30



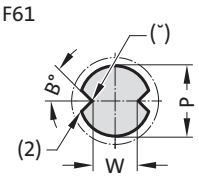
F˘°



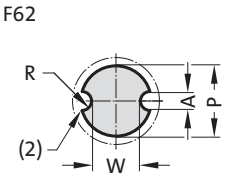
F˘˛



F61

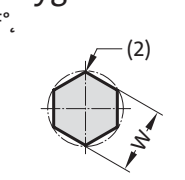


F62

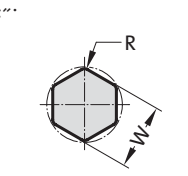


Polygons

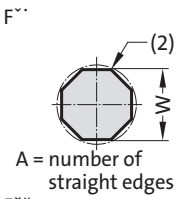
F°˛



F˝˙

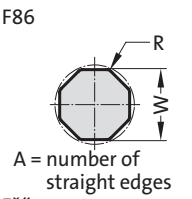


F˙˙



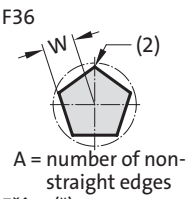
A = number of straight edges

F86



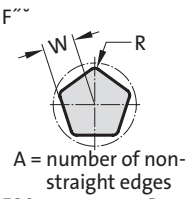
A = number of straight edges

F36



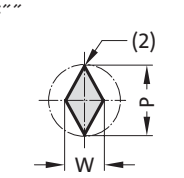
A = number of non-straight edges

F˝˘

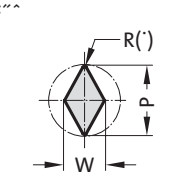


A = number of non-straight edges

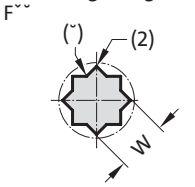
F˝˝



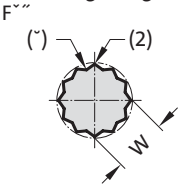
F˝˄



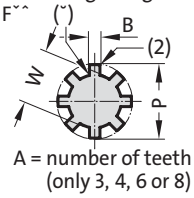
F˘˘



F˘˝

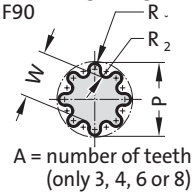


F˘˄



A = number of teeth (only 3, 4, 6 or 8)

F90



A = number of teeth (only 3, 4, 6 or 8)

270°

0°

Ordering examples
Special shapes Punches/Matrixes (standardised)

2 2 9 1 . ___ . F 4 4 . . .

Punch:
22 without ejector pin

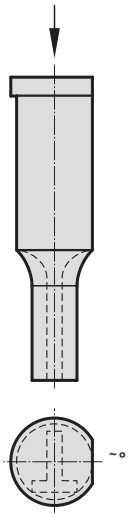
Special shape

Type:	Order No
ISO 8020	= 1
ball-lock, light duty	= 2
ball-lock, heavy duty	= 3
ball-lock, larger cutting edge, light duty	= 4
ball-lock, larger cutting edge, heavy duty	= 5

You will find diameters and lengths on the pages of punches you have selected.

NB:
All the parameters must be given for special shapes!

Special shape F 44



2 6 9 6 . ___ . F 4 4 . . .

Matrixes

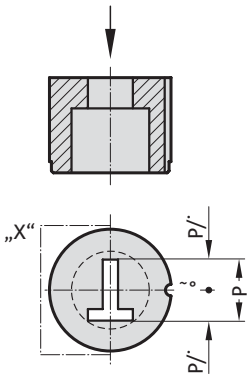
Special shape

Type:	Order No
automotive	= 5
without shoulder ISO 8977	= 6
with shoulder ISO 8977	= 7

You will find diameters and lengths on the pages of cutting bushes you have selected.

NB:
All the parameters must be given for special shapes!

Special shape F 44



Cutting gap (a)

Roundings with the corresponding sharp corners reduce the cutting gap per side (a). If the cutting gap is 0.04 mm (a) or less, FIBRO will round the sharp edges if the cutting punch and the matrixes are ordered together. This reduces the installation time and the risk of an edge breaking during operation.

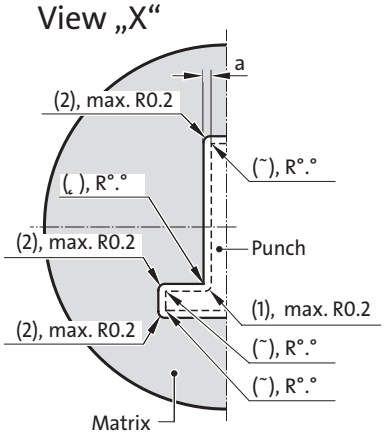
Note:

(1) and (2) - r oundings and sharp edges

(1) rounding on the cutting punch of max. R0.2, corresponds to a sharp edge on the matrix

(2) rounding on the cutting matrix of max. R0.2, corresponds to a sharp edge on the punch

View „X“

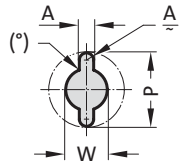


Standardised special shapes

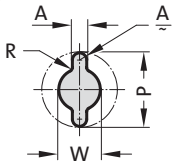
90°

Multi key-hole shapes

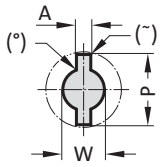
F~°



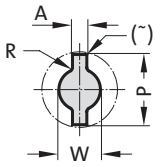
F˛°



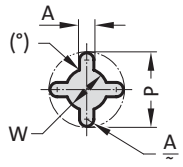
F˝˙



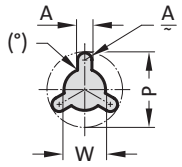
F^˙



F~ˇ

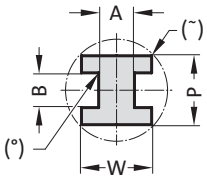


F~¨

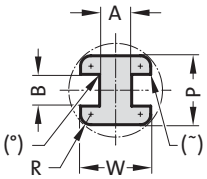


Double T-shapes

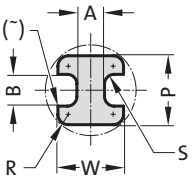
F˝~



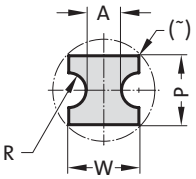
F°~



F°˝

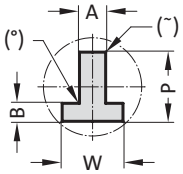


F~˛

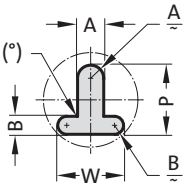


Simple T-shapes

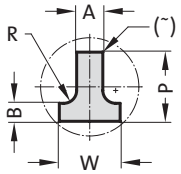
F44



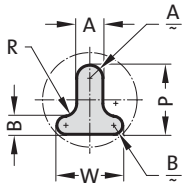
F^^



F45



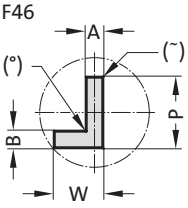
F^ˇ



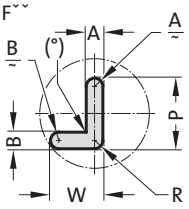
L-shapes

180°

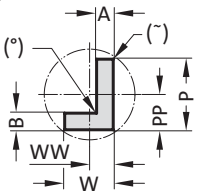
F46



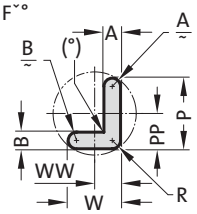
F^ˇ



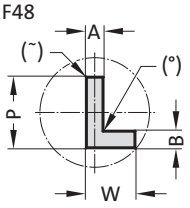
F^¨



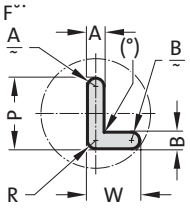
F^°



F48

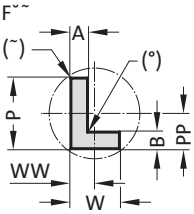


F^˙

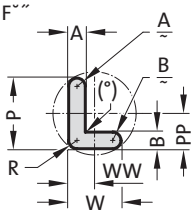


0°

F^¨



F^˝



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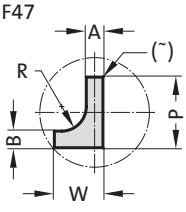
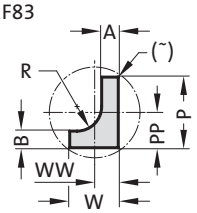
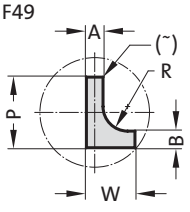


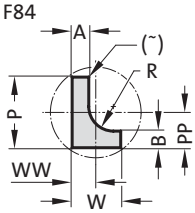
F83



F49

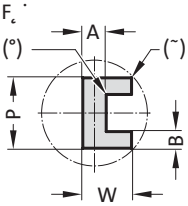


F84

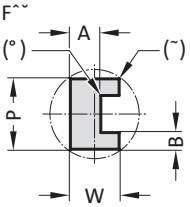


U-shapes

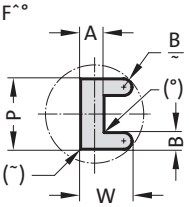
F˛˙



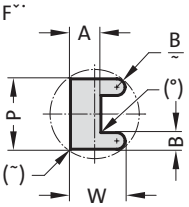
F^˝



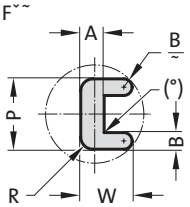
F^°



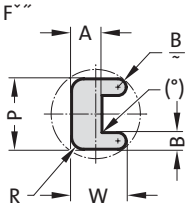
F^¨



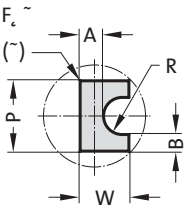
F^˜



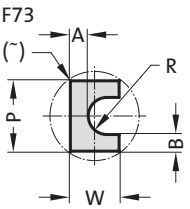
F^˝



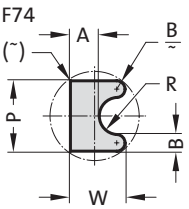
F˛˜



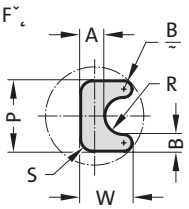
F73



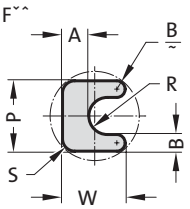
F74



F˘˛



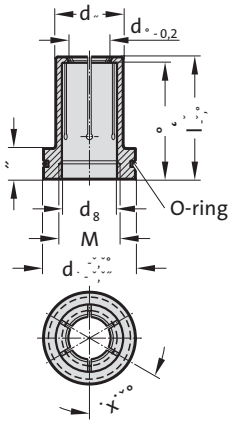
F^^

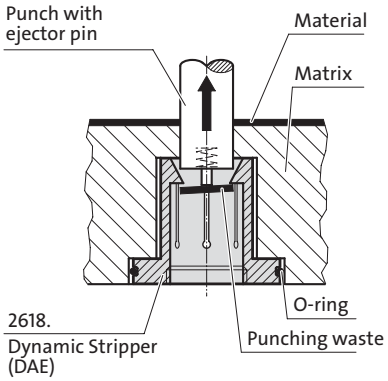


270°

Dynamic stripping element (DAE)

2618.





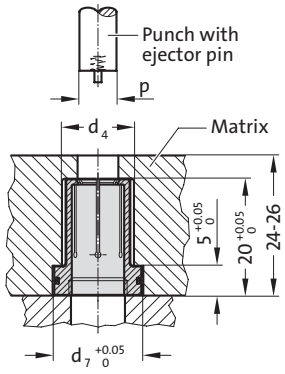
Description:

The dynamic stripper is used in blanking tools for punching operations using material up to 2 mm thick. The stripper is below the die. It is similar in shape to a segmented chuck. After the punching operation the punch enters the stripper with the punch waste still attached. The dynamic stripper opens up to receive the punch. On the return stroke the dynamic stripper strips the punch waste from the punch. The stripping element diameter d_1 is manufactured 0.2 mm smaller than the diameter p of the punch. To ensure reliable stripping the minimum entry depth into the dynamic stripper must be no less than 1 mm. The dynamic stripper can help to protect both the tool and the product from damage and also accelerate the production rate.

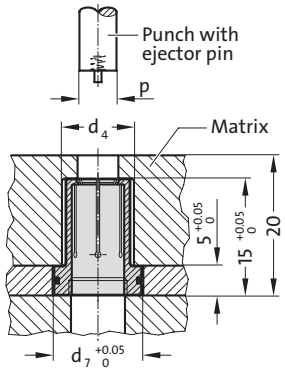
Material:

Steel, hardened

Mounting example



Mounting example



2618. Dynamic stripping element (DAE)

Cutting punch p Diameter steps 0.01	DAE d_1 Order-Ø	d_5	d_6	l	M	Matrix d_4	d_7
3.00-3.09	3	7	11	19.95	M6	8	11
3.10-3.19	3.1	7	11	19.95	M6	8	11
3.20-3.29	3.2	7	11	19.95	M6	8	11
3.30-3.39	3.3	7	11	19.95	M6	8	11
3.40-3.49	3.4	7	11	19.95	M6	8	11
3.50-3.59	3.5	7	11	19.95	M6	8	11
3.60-3.69	3.6	7	11	19.95	M6	8	11
3.70-3.79	3.7	7	11	19.95	M6	8	11
3.80-3.89	3.8	7	11	19.95	M6	8	11
3.90-3.99	3.9	7	11	19.95	M6	8	11
4.00-4.09	4	7	11	19.95	M6	8	11
4.10-4.19	4.1	8	12	19.95	M8	9	12
4.20-4.29	4.2	8	12	19.95	M8	9	12
4.30-4.39	4.3	8	12	19.95	M8	9	12
4.40-4.49	4.4	8	12	19.95	M8	9	12
4.50-4.59	4.5	8	12	19.95	M8	9	12
4.60-4.69	4.6	8	12	19.95	M8	9	12
4.70-4.79	4.7	8	12	19.95	M8	9	12
4.80-4.89	4.8	8	12	19.95	M8	9	12
4.90-4.99	4.9	8	12	19.95	M8	9	12
5.00-5.09	5	8	12	19.95	M8	9	12
5.10-5.19	5.1	9	13	19.95	M8	10	13
5.20-5.29	5.2	9	13	19.95	M8	10	13
5.30-5.39	5.3	9	13	19.95	M8	10	13
5.40-5.49	5.4	9	13	19.95	M8	10	13
5.50-5.59	5.5	9	13	19.95	M8	10	13
5.60-5.69	5.6	9	13	19.95	M8	10	13
5.70-5.79	5.7	9	13	19.95	M8	10	13
5.80-5.89	5.8	9	13	19.95	M8	10	13
5.90-5.99	5.9	9	13	19.95	M8	10	13
6.00-6.09	6	9	13	19.95	M8	10	13
6.10-6.19	6.1	10	14	19.95	M10	11	14
6.20-6.29	6.2	10	14	19.95	M10	11	14
6.30-6.39	6.3	10	14	19.95	M10	11	14
6.40-6.49	6.4	10	14	19.95	M10	11	14
6.50-6.59	6.5	10	14	19.95	M10	11	14
6.60-6.69	6.6	10	14	19.95	M10	11	14
6.70-6.79	6.7	10	14	19.95	M10	11	14
6.80-6.89	6.8	10	14	19.95	M10	11	14
6.90-6.99	6.9	10	14	19.95	M10	11	14
7.00-7.09	7	10	14	19.95	M10	11	14
7.10-7.19	7.1	11	15	19.95	M10	12	15
7.20-7.29	7.2	11	15	19.95	M10	12	15
7.30-7.39	7.3	11	15	19.95	M10	12	15
7.40-7.49	7.4	11	15	19.95	M10	12	15
7.50-7.59	7.5	11	15	19.95	M10	12	15
7.60-7.69	7.6	11	15	19.95	M10	12	15
7.70-7.79	7.7	11	15	19.95	M10	12	15
7.80-7.89	7.8	11	15	19.95	M10	12	15
7.90-7.99	7.9	11	15	19.95	M10	12	15
8.00-8.09	8	11	15	19.95	M10	12	15

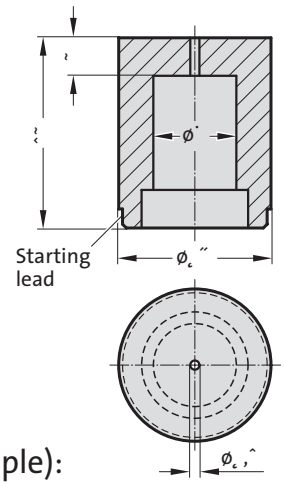
Ordering Code (example):

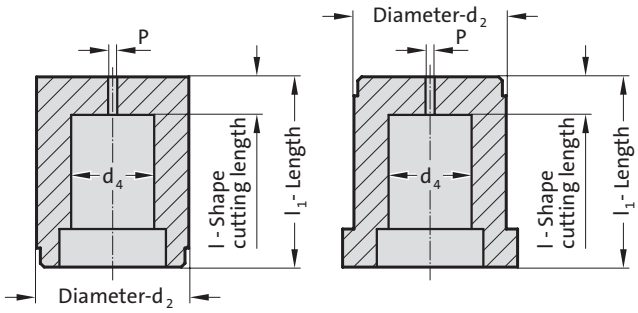
Dynamic stripping element (DAE)		=	2618.
External diameter d_5	7 mm	=	07.
Order length BL	20 mm	=	020.
Order diameter d_1	3 mm	=	0300
Order No		=	2618. 07. 020. 0300

Ordering Code (example)
Matrixes for Dynamic Stripper (DAE)

Note:

See table
for standard dimensions

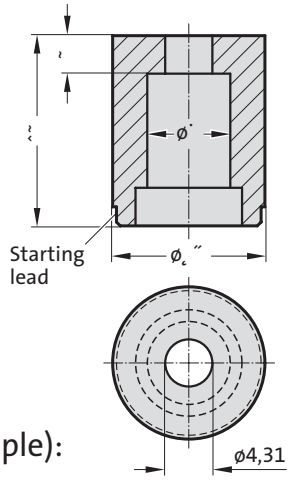


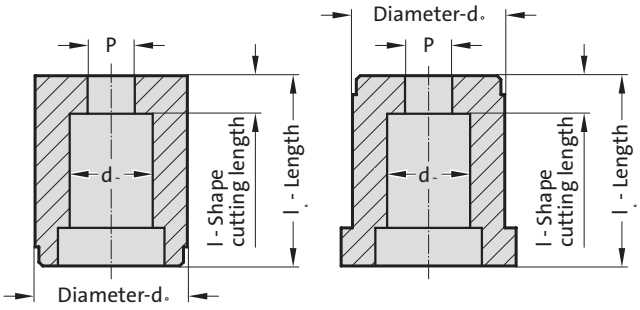


Ordering Code (example):

2618.06.6E4.09

d_4 = 9 mm	(09)	d_4= 9 mm
Shape cutting length: l = 5 mm	(4)	Shape cutting length l = 5 → Order No = 4
Length: l_1 = 25 mm	(E)	Length l_1 = 25 → Order Code character = E
Diameter: d_2 = 16 mm	(6)	Diameter d_2: 13 → = 5; 16 → = 6; 20 → = 7
Type: without collar for Dynamic Stripper DAE	(6)	Type: without collar for DAE → = 6; with collar for DAE → = 7
Version: Blank (pilot hole bore)	(0)	Version: blank (pilot hole bore) → = 0
Matrix for Dynamic Stripper (DAE)	(2618)	Matrixes for Dynamic Stripper (DAE)





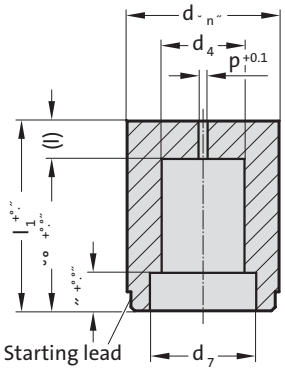
Ordering Code (example):

2618.16.6E4.0431

Shape: Round, P = 4,31 mm	(0431)	Shape: Round, P = 4,31 mm
Shape cutting length: l = 5 mm	(4)	Shape cutting length l = 5 → Order No = 4
Shape cutting length: l_1 = 25 mm	(E)	Length l_1 = 25 → Order Code character = E
Diameter: d_2 = 16 mm	(6)	Diameter d_2: 13 → = 5; 16 → = 6; 20 → = 7
Type: without collar for Dynamic Stripper DAE	(6)	Type: without collar for DAE → = 6; with collar for DAE → = 7
Version: Round	(1)	Version: Round → = 1
Matrix for Dynamic Stripper (DAE)	(2618)	Matrixes for Dynamic Stripper (DAE)

Matrix without collar for dynamic stripper (DAE), blank

2618.06.



2618.06. Matrix without collar for dynamic stripper (DAE), blank

d_2	d_4	d_7	p	l	l_1
13	8	11	1.2	5	25
16	9	12	1.2	5	25
16	10	13	1.5	5	25
20	11	14	1.5	5	25
20	12	15	1.5	5	25

Ordering-code (example):

2 6 1 8 . 0 6 . 6 E 4 . 0 9

Diameter d_4	9 mm	= 09
Shape cutting length: l	5 mm	**Order number** = (4)
Length: l_1	25 mm	**Order code character** = (E)
Diameter d_2	16 mm	**Order number** = (6)
Type:	without sholder for DAE	**Order number** = (6)
Version:	Blank (pilot hole bore)	**Order number** = (0)
for Dynamic Stripper (DAE)		= 18
Matrix		= 26

Material:

HSS
Hardness 62 ± 2 HRC

Execution:

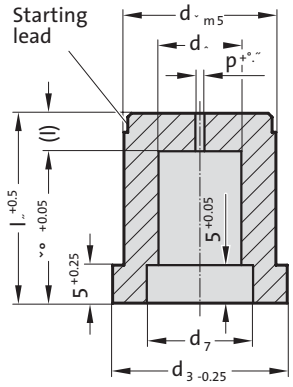
Diameter d_2, starting lead and face surfaces ground.
Diameter P is a bored pilot hole for wire EDM.

Note:

Order dynamic stripping element (DAE) separately.

Matrix with collar for dynamic stripper (DAE), blank

2618.07.



2618.07. Matrix with collar for dynamic stripper (DAE), blank

d_2	d_3	d_4	d_7	p	l	l_1
13	16	8	11	1.2	5	25
16	19	9	12	1.2	5	25
16	19	10	13	1.5	5	25
20	23	11	14	1.5	5	25
20	23	12	15	1.5	5	25

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2, starting lead and face surfaces ground.
Diameter P is a bored pilot hole for wire EDM.

Note:
Order dynamic stripping element (DAE) separately.

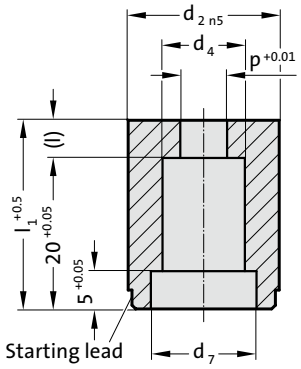
Ordering-code (example):

2 6 1 8 . 0 7 . 6 E 4 . 0 9

Diameter d_4	9 mm	= 09
Shape cutting length: l	5 mm	**Order number** = (4)
Length: l_1	25 mm	**Order code character** = (E)
Diameter d_2	16 mm	**Order number** = (6)
Type:	with sholder for DAE	**Order number** = (7)
Version:	Blank (pilot hole bore)	**Order number** = (0)
	for Dynamic Stripper (DAE)	= 18
	Matrix	= 26

MATRIX WITHOUT COLLAR FOR DYNAMIC STRIPPER (DAE), ROUND

2618.16.



2618.16. Matrix without collar for dynamic stripper (DAE), round

d_2	d_4	d_7	l	l_1	Matrix Diameter steps 0.01 P	DAE d_5	d_1 Gradation 0.1
13	8	11	5	25	3 - 4,29	7	3-4
16	9	12	5	25	4,3 - 5,29	8	4.1-5
16	10	13	5	25	5,3 - 6,29	9	5.1-6
20	11	14	5	25	6,3 - 7,29	10	6.1-7
20	12	15	5	25	7,3 - 8,29	11	7.1-8

Ordering Code (example):

2618.16.6E4.0431

Shape: round P = ø4,31 mm	= 0431
Shape cutting length: l 5 mm	**Order No** = (4)
Length: l_1 25 mm	**Order Code character** = (E)
Diameter d_2 16 mm	**Order No** = (6)
Type: without collar for DAE	**Order No** = (6)
Execution: round for Dynamic Stripper (DAE)	**Order No** = (1) = 18
Matrix	= 26

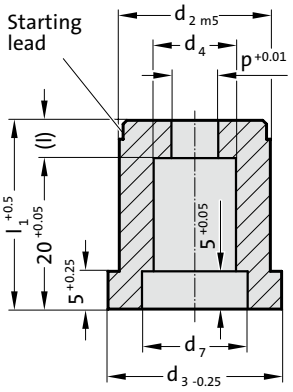
Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2, starting lead and end faces ground.

Note:
Order dynamic stripping element (DAE) separately.

MATRIX WITH COLLAR FOR DYNAMIC STRIPPER (DAE), ROUND

2618.17.



2618.17. Matrix with collar for dynamic stripper (DAE), round

d_2	d_3	d_4	d_7	l	l_1	Matrix Diameter steps 0.01 P	DAE d_5	d_1 Gradation 0.1
13	16	8	11	5	25	3 - 4,29	7	3-4
16	19	9	12	5	25	4,3 - 5,29	8	4.1-5
16	19	10	13	5	25	5,3 - 6,29	9	5.1-6
20	23	11	14	5	25	6,3 - 7,29	10	6.1-7
20	23	12	15	5	25	7,3 - 8,29	11	7.1-8

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2, starting lead and end faces ground.

Note:
Order dynamic stripping element (DAE) separately.

Ordering Code (example):

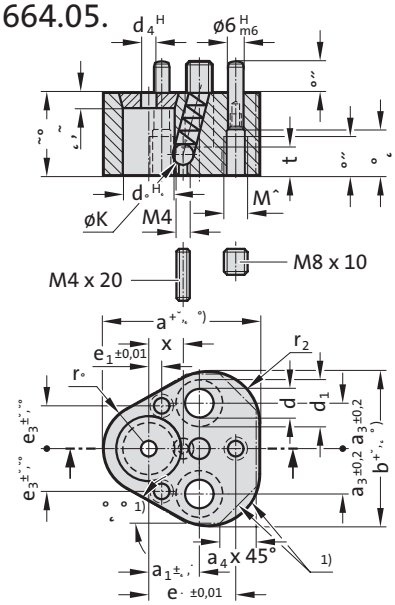
2618.17.6E4.0431

Shape: round	P = ø4,31 mm	= 0431
Shape cutting length: l	5 mm	**Order No** = (4)
Length: l_1	25 mm	**Order Code character** = (E)
Diameter d_2	16 mm	**Order No** = (6)
Type:	with collar for DAE	**Order No** = (7)
Execution:	round	**Order No** = (1)
	for Dynamic Stripper (DAE)	= 18
Matrix		= 26

Retainers for ball-lock punches

Triangle retainer for ball-lock punches, light duty

2664.05.



Execution:

Version for metal thicknesses up to 3 mm. The punch locating hole d_2 is manufactured to a tolerance of ± 0.01 mm relative to the 6 stud holes H7. This ensures the interchangeability of the locating plate with other polygon versions.

Note:

Special punch retainers available to order.

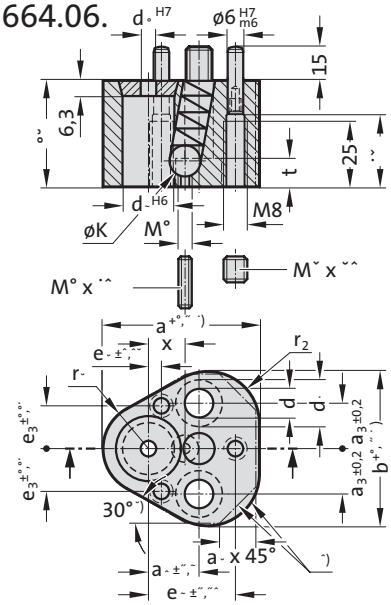
1) Contours may vary. Maximum dimensions are specified in the table.

2664.05. Triangle retainer for ball-lock punches, light duty

Order No	d	d_1	d_2	d_4	a	a_1	a_3	a_4	b	e_1	e_2	e_3	ØK	t	r_1	r_2	x
2664.05.10	9	15	10	6	44.5	19	11.1	10	43.7	7.5	26.925	9	8	9	9.5	12	8.2
2664.05.13	9	15	13	6	50.8	19	14.3	12	50	6.5	29.97	12	8	9	12.7	15.2	9.5
2664.05.16	9	15	16	6	54	19	15.9	13	53.2	6	31.75	13.5	8	9	14.3	16.8	11.2
2664.05.20	11	18	20	6	60.3	19	17.5	14	59.5	5	33.53	16.5	8	11	17.5	20	13.2
2664.05.25	13.5	20	25	6	69.9	23.8	19.8	16	69.1	7	40.64	22	8	13.5	22.2	24.7	15.7
2664.05.32	13.5	20	32	6	69.9	23.8	19.8	16	69.1	7	40.64	22	8	13.5	22.2	24.7	19.25
2664.05.38	13.5	20	38	6	77.4	27	24	18	76.6	10	43.993	26	8	13.5	26	28.5	22.25

Triangle retainer for ball-lock punches, heavy duty

2664.06.



Execution:

Version for metal thicknesses > 3 mm/max. 6 mm. The punch locating hole d_2 is manufactured to a tolerance of ± 0.01 mm relative to the 6 stud holes H7. This ensures the interchangeability of the locating plate with other polygon versions.

Note:

Special punch retainers available to order.

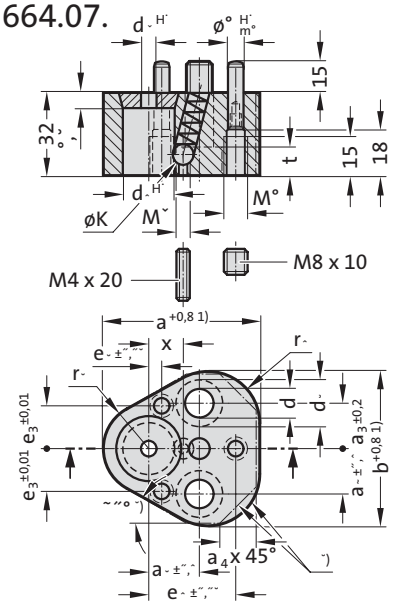
1) Contours may vary. Maximum dimensions are specified in the table.

2664.06. Triangle retainer for ball-lock punches, heavy duty

Order No	d	d_1	d_2	d_4	a	a_1	a_3	a_4	b	e_1	e_2	e_3	ØK	t	r_1	r_2	x
2664.06.10	9	15	10	6	44.5	19	11.1	10	43.7	7.5	26.925	9	10	9	9.5	12	9.8
2664.06.13	9	15	13	6	50.8	19	14.3	12	50	6.5	29.97	12	12	9	12.7	15.2	11.3
2664.06.16	9	15	16	6	54	19	15.9	13	53.2	6	31.75	13.5	12	9	14.3	16.8	12.8
2664.06.20	11	18	20	6	60.3	19	17.5	14	59.5	5	33.53	16.5	12	11	17.5	20	14.8
2664.06.25	13.5	20	25	6	69.9	23.8	19.8	16	69.1	7	40.64	22	12	13.5	22.2	24.7	17.3
2664.06.32	13.5	20	32	6	69.9	23.8	19.8	16	69.1	7	40.64	22	12	13.5	22.2	24.7	20.8
2664.06.40	13.5	20	40	6	77.4	27	24	18	76.6	10	43.993	26	12	13.5	26	28.5	24.8

Triangle retainer for ball-lock punches, light duty

2664.07.



Execution:

Version for metal thicknesses up to 3 mm. The punch locating hole d_2 is manufactured to a tolerance of ± 0.01 mm relative to the 6 stud holes H7. This ensures the interchangeability of the locating plate with other polygon versions.

Note:

Special punch retainers available to order.

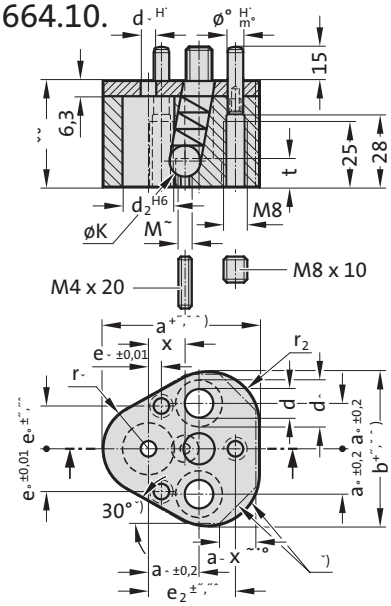
1) Contours may vary. Maximum dimensions are specified in the table.

2664.07. Triangle retainer for ball-lock punches, light duty

Order No	d	d_1	d_2	d_4	a	a_1	a_3	a_4	b	e_1	e_2	e_3	ØK	t	r_1	r_2	x
2664.07.06	6.6	11	6	3	35	19	11.1	6	37.5	9	23	8	6	7	8	8	5.7

Triangle retainer for ball-lock punches, heavy duty

2664.10.



Execution:

Version for metal thicknesses > 3 mm/max. 6 mm. The punch locating hole d_2 is manufactured to a tolerance of ± 0.01 mm relative to the 6 stud holes H7. This ensures the interchangeability of the locating plate with other polygon versions.

Note:

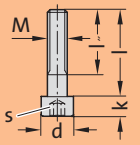
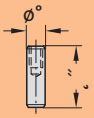
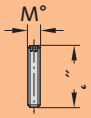
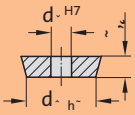
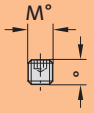
Special punch retainers available to order.
Pressure plate welded.

1) Contours may vary. Maximum dimensions are specified in the table.

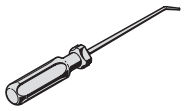
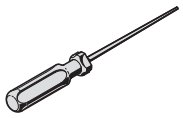
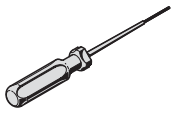
2664.10. Triangle retainer for ball-lock punches, heavy duty

Order No	d	d_1	d_2	d_4	a	a_1	a_3	a_4	b	e_1	e_2	e_3	ØK	t	r_1	r_2	x
2664.10.10	9	15	10	6	44.5	19	11.1	10	43.7	7.5	26.925	9	10	9	9.5	12	9.8
2664.10.13	9	15	13	6	50.8	19	14.3	12	50	6.5	29.97	12	12	9	12.7	15.2	11.3
2664.10.16	9	15	16	6	54	19	15.9	13	53.2	6	31.75	13.5	12	9	14.3	16.8	12.8
2664.10.20	11	18	20	6	60.3	19	17.5	14	59.5	5	33.53	16.5	12	11	17.5	20	14.8
2664.10.25	13.5	20	25	6	69.9	23.8	19.8	16	69.1	7	40.64	22	12	13.5	22.2	24.7	17.3
2664.10.32	13.5	20	32	6	69.9	23.8	19.8	16	69.1	7	40.64	22	12	13.5	22.2	24.7	20.8
2664.10.40	13.5	20	40	6	77.4	27	24	18	76.6	10	43.993	26	12	13.5	26	28.5	24.8

Accessories for Retainers, triangular, for Ball-Lock Punches

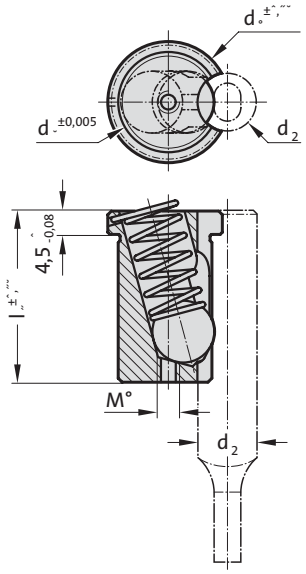
		2192.10.	236.1.	2666.04.	2192.72.	2666.06.	2666.01. .1	2192.72.
								
Retainer	∅ d_2	Socket head cap screw	Dowel pin	Ball	Ball release pin	Spring	Pressure disk for centring pin	Pin screw
2664.05.	10	2192.10.08.035	236.1.0600.020	2666.04.008	2192.72.04.020	2666.06.008	2666.01.10.1	2192.72.08.008
	13	2192.10.08.035	236.1.0600.020	2666.04.008	2192.72.04.020	2666.06.008	2666.01.13.1	2192.72.08.008
	16	2192.10.08.035	236.1.0600.020	2666.04.008	2192.72.04.020	2666.06.008	2666.01.16.1	2192.72.08.008
	20	2192.10.10.035	236.1.0600.020	2666.04.008	2192.72.04.020	2666.06.008	2666.01.20.1	2192.72.08.008
	25	2192.10.12.035	236.1.0600.020	2666.04.008	2192.72.04.020	2666.06.008	2666.01.25.1	2192.72.08.008
	32	2192.10.12.035	236.1.0600.020	2666.04.008	2192.72.04.020	2666.06.008	2666.01.32.1	2192.72.08.008
	38	2192.10.12.035	236.1.0600.020	2666.04.008	2192.72.04.020	2666.06.008	2666.01.38.1	2192.72.08.008
2664.06./10.	10	2192.10.08.040	236.1.0600.020	2666.04.010	2192.72.04.020	2666.06.010	2666.01.10.1	2192.72.08.008
	13	2192.10.08.040	236.1.0600.020	2666.04.012	2192.72.04.020	2666.06.012	2666.01.13.1	2192.72.08.008
	16	2192.10.08.040	236.1.0600.020	2666.04.012	2192.72.04.020	2666.06.012	2666.01.16.1	2192.72.08.008
	20	2192.10.10.050	236.1.0600.020	2666.04.012	2192.72.04.020	2666.06.012	2666.01.20.1	2192.72.08.008
	25	2192.10.12.050	236.1.0600.020	2666.04.012	2192.72.04.020	2666.06.012	2666.01.25.1	2192.72.08.008
	32	2192.10.12.050	236.1.0600.020	2666.04.012	2192.72.04.020	2666.06.012	2666.01.32.1	2192.72.08.008
	40	2192.10.12.050	236.1.0600.020	2666.04.012	2192.72.04.020	2666.06.012	2666.01.40.1	2192.72.08.008
2664.07.	6	2192.10.06.035	236.1.0600.020	2666.04.006	2192.72.04.020	2666.06.006	2666.01.06.1	2192.72.08.008

Ball release tool

Hook shape	straight	straight with threaded tip
2666.05.01	2666.05.02	2666.05.03
		

ACCU-LOCK Fixture device for ball-lock punches, light duty

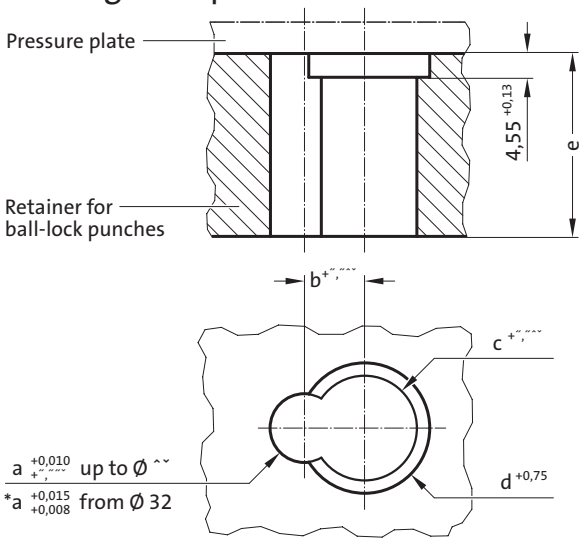
2668.2.



Note:

Use ball release tool 2666.05.02, straight.

Mounting example

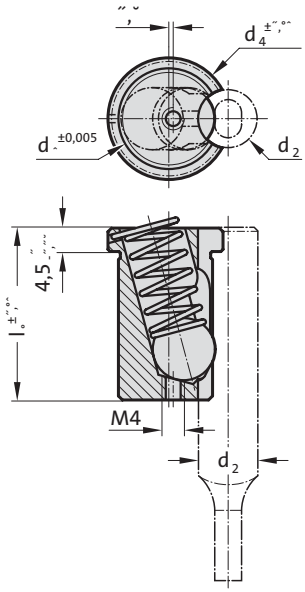


2668.2. ACCU-LOCK Fixture device for ball-lock punches, light duty

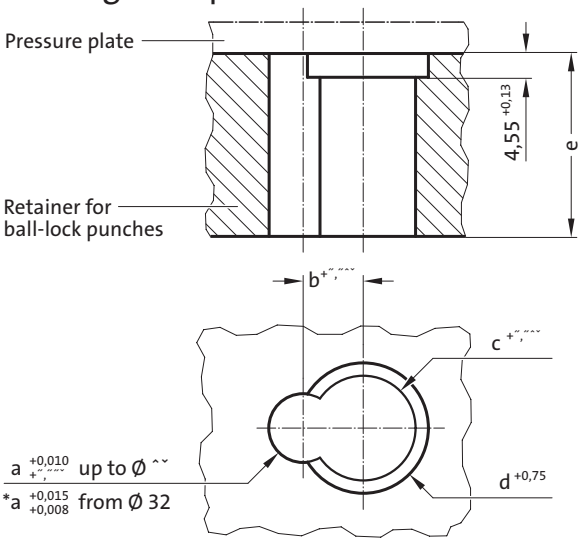
Order No	d_2	d_3	d_4	l_1	a	b	c	d	e
2668.2.06	6	12	14.6	25.7	6	6.5	12.013	15	25.7
2668.2.10	10	14	16.6	25.7	10	9	14.013	17	25.7
2668.2.13	13	14	16.6	25.7	13	10.5	14.013	17	25.7
2668.2.16	16	14	16.6	25.7	16	12	14.013	17	25.7
2668.2.20	20	16	18.6	25.7	20	14	16.013	19	25.7
2668.2.25	25	16	18.6	25.7	25	16.5	16.013	19	25.7
2668.2.32	32	16	18.6	25.7	32	20	16.013	19	25.7
2668.2.38	38	16	18.6	25.7	38	23	16.013	19	25.7

ACCU-LOCK Fixture device for ball-lock punches, heavy duty

2668.3.



Mounting example



Note:

Use ball release tool 2666.05.02, straight.

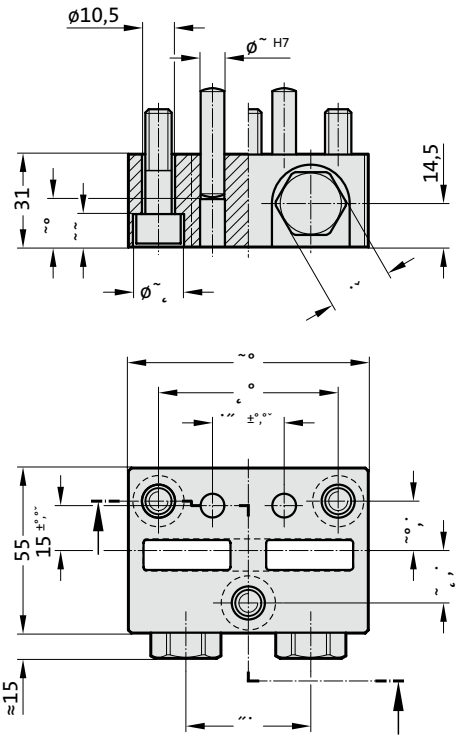
2668.3. ACCU-LOCK Fixture device for ball-lock punches, heavy duty

Order No	d_2	d_3	d_4	l_1	a	b	c	d	e
2668.3.10	10	16	19.6	34.7	10	10	16.013	20	34.7
2668.3.13	13	20	24.6	34.7	13	11.5	20.013	25	34.7
2668.3.16	16	20	24.6	34.7	16	13	20.013	25	34.7
2668.3.20	20	20	24.6	34.7	20	15	20.013	25	34.7
2668.3.25	25	20	24.6	34.7	25	17.5	20.013	25	34.7
2668.3.32	32	20	24.6	34.7	32	21	20.013	25	34.7
2668.3.40	40	20	24.6	34.7	40	25	20.013	25	34.7

Retainer
BOLT LOCK

05.2017

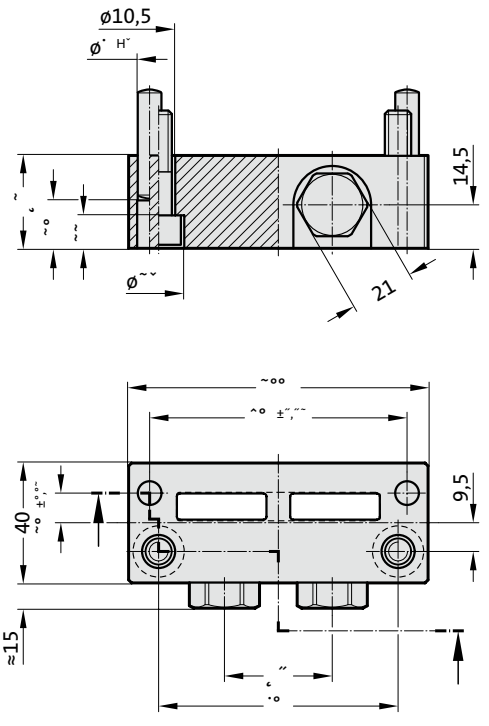
Retainer BOLT LOCK



Material:
HWS (1.2379)
Hardness 60 +2 HRC

Note:
Delivery including socket cap screws
DIN EN ISO 4762 and pins
DIN EN ISO 8735

2664.11.02

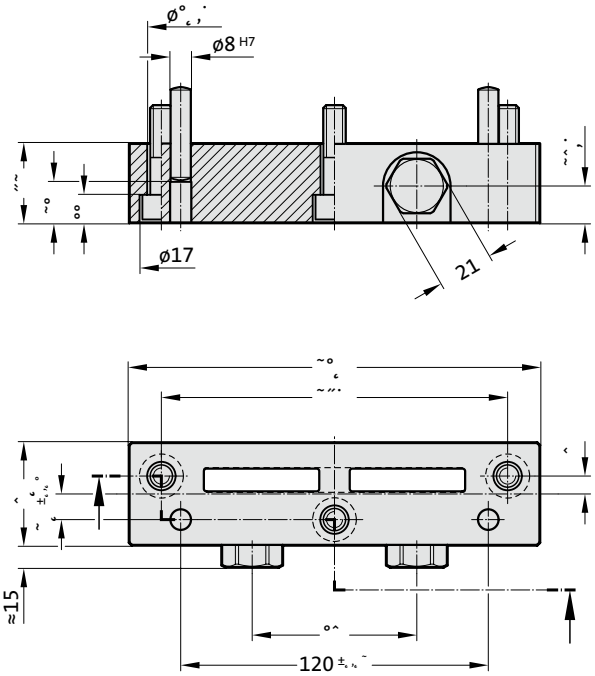


Material:
HWS (1.2379)
Hardness 60 +2 HRC

Note:
Delivery including socket cap screws
DIN EN ISO 4762 and pins
DIN EN ISO 8735

Retainer BOLT LOCK

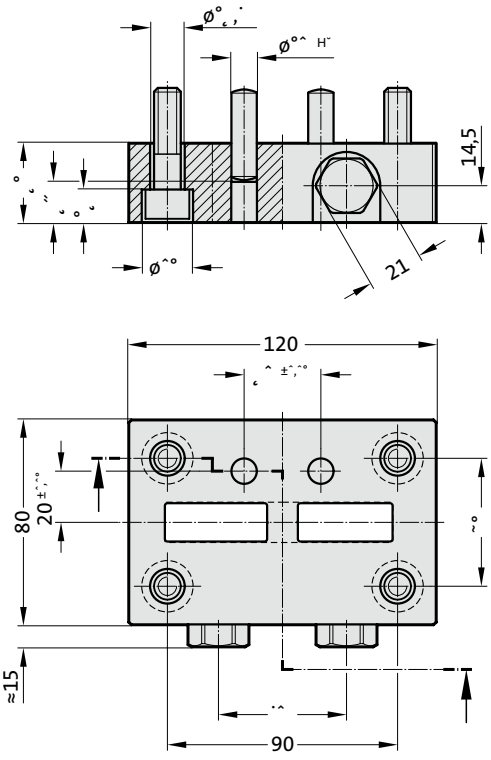
2664.11.03



Material:
HWS (1.2379)
Hardness 60 +2 HRC

Note:
Delivery including socket cap screws
DIN EN ISO 4762 and pins
DIN EN ISO 8735

2664.11.04

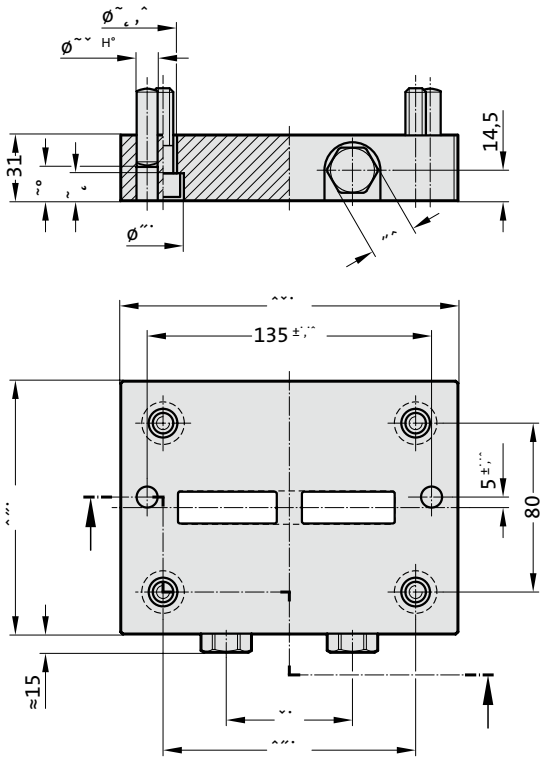


Material:
HWS (1.2379)
Hardness 60 +2 HRC

Note:
Delivery including socket cap screws
DIN EN ISO 4762 and pins
DIN EN ISO 8735

Retainer BOLT LOCK

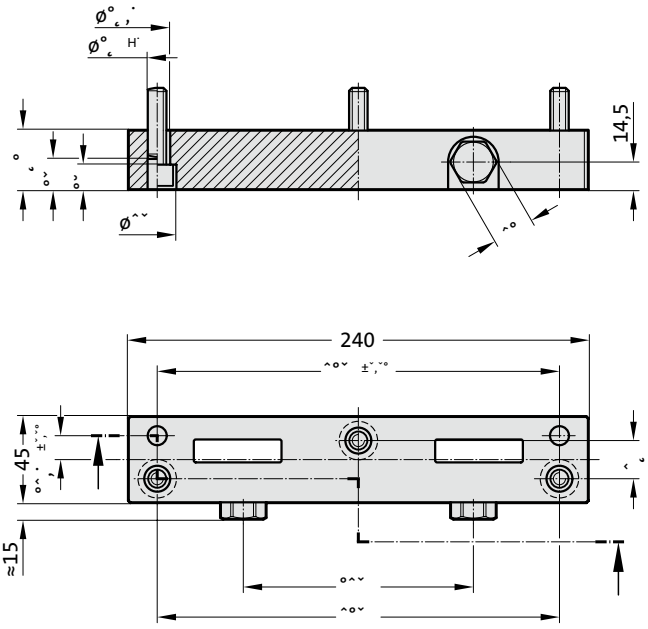
2664.11.05



Material:
HWS (1.2379)
Hardness 60 +2 HRC

Note:
Delivery including socket cap screws
DIN EN ISO 4762 and pins
DIN EN ISO 8735

2664.11.06

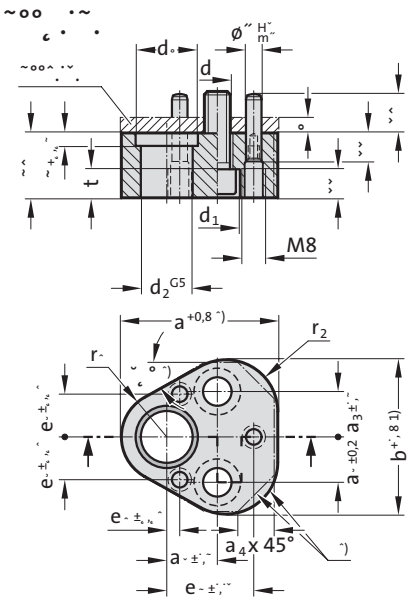


Material:
HWS (1.2379)
Hardness 60 +2 HRC

Note:
Delivery including socket cap screws
DIN EN ISO 4762 and pins
DIN EN ISO 8735

Retainers for punches ISO 8020

Triangle retainer, for punches ISO 8020 without anti-rotation element



Execution:

The centres of the pinholes are the reference points for the position of the punch bore.
The dimensions e_1, e_2 and e_3 have a tolerance of ± 0.01 mm.
The triangle ball-lock retainers are interchangeable.

Note:

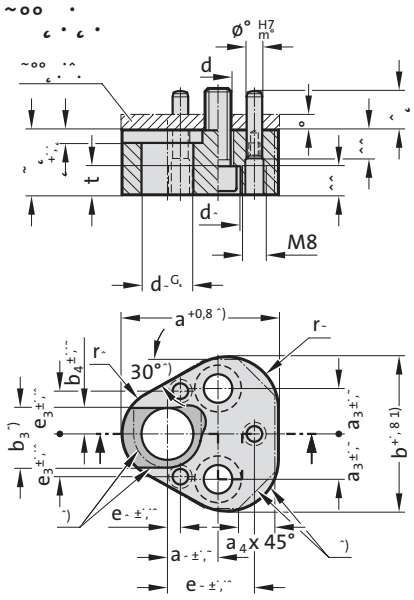
Pressure plate 2665.01. to be ordered separately for the receiving punch plate.

1) Contours may vary. Maximum dimensions are specified in the table.

2664.02. Triangle retainer, for punches ISO 8020 without anti-rotation element

Order No	d	d_1	d_2	d_3	a	a_1	a_3	a_4	b	e_1	e_2	e_3	t	r_1	r_2
2664.02.10	9	15	10	14	44.5	19	11.1	10	43.7	7.5	26.925	9	9	9.5	12
2664.02.13	9	15	13	17	50.8	19	14.3	12	50	6.5	29.97	12	9	12.7	15.2
2664.02.16	9	15	16	20	54	19	15.9	13	53.2	6	31.75	13.5	9	14.3	16.8
2664.02.20	11	18	20	24	60.3	19	17.5	14	59.5	5	33.53	16.5	11	17.5	20
2664.02.25	13.5	20	25	29	69.9	23.8	19.8	16	69.1	7	40.64	22	13.5	22.2	24.7
2664.02.32	13.5	20	32	36	69.9	23.8	19.8	16	69.1	7	40.64	22	13.5	22.2	24.7

Triangle retainer, for punches ISO 8020 with anti-rotation element



Execution:

The centres of the pinholes are the reference points for the position of the punch bore.
The dimensions e_1, e_2 and e_3 have a tolerance of ± 0.01 mm.
The triangle ball-lock retainers are interchangeable.

Note:

Pressure plate 2665.01. to be ordered separately for the receiving punch plate.

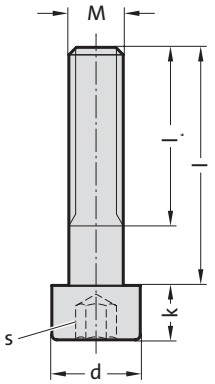
1) Contours may vary. Maximum dimensions are specified in the table.

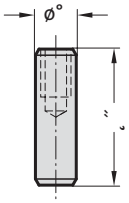
2664.04. Triangle retainer, for punches ISO 8020 with anti-rotation element

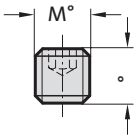
Order No	d	d_1	d_2	a	a_1	a_3	a_4	b	b_3	b_4	e_1	e_2	e_3	t	r_1	r_2
2664.04.10	9	15	10	44.5	19	11.1	10	43.7	12	5	7.5	26.925	9	9	9.5	12
2664.04.13	9	15	13	50.8	19	14.3	12	50	15	6.5	6.5	29.97	12	9	12.7	15.2
2664.04.16	9	15	16	64	19	15.9	13	53.2	18	8	6	31.75	13.5	9	14.3	16.8
2664.04.20	11	18	20	60.3	19	17.5	14	59.5	23	10	5	33.53	16.5	11	17.5	20
2664.04.25	13.5	20	25	69.9	23.8	19.8	16	69.1	28	12.5	7	40.64	22	13.5	22.2	24.7
2664.04.32	13.5	20	32	69.9	23.8	19.8	16	69.1	35	16	7	40.64	22	13.5	22.2	24.7

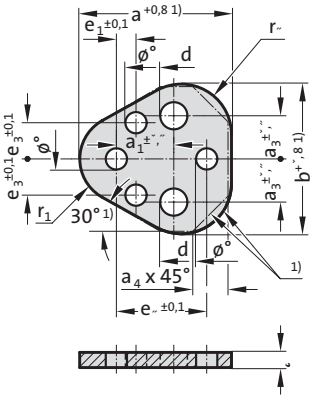
Accessories for Retainers, triangular, for Punches, to ISO 8020

2192.10. 2665.01.







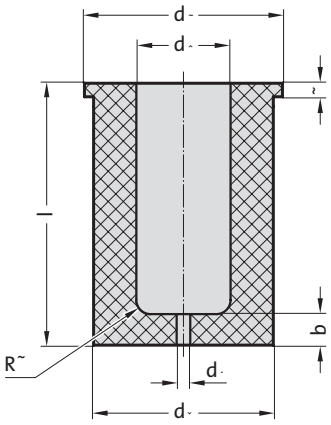


Retainer	Ø d_2	Socket head cap screw	Dowel pin	Pin screw	Pressure plate
2664.02./04.	10	2192.10.08.035	236.1.0600.020	2192.72.08.008	2665.01.10
	13	2192.10.08.035	236.1.0600.020	2192.72.08.008	2665.01.13
	16	2192.10.08.035	236.1.0600.020	2192.72.08.008	2665.01.16
	20	2192.10.10.035	236.1.0600.020	2192.72.08.008	2665.01.20
	25	2192.10.12.035	236.1.0600.020	2192.72.08.008	2665.01.25
	32	2192.10.12.035	236.1.0600.020	2192.72.08.008	2665.01.32

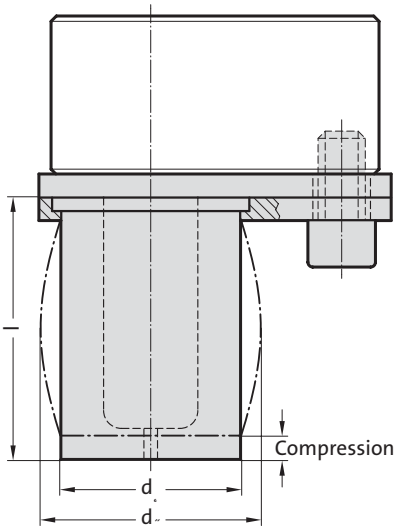
Accessories

Stripping unit

2431.7.



Installation example:



Material:

FIBROFLEX® 95 Shore A

Note:

Stripping units can be used for retainers 2664.02./04./05./06./10.

* values for the stripping force are dependent on a number of parameters (e.g. lubricant, temperature etc.) and may vary from those given here.

** max spring travel should not exceed 15% of the length

2431.7. Stripping unit

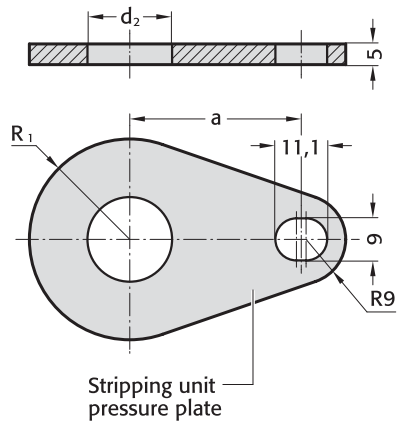
d_2	d_1	d_3	d_4	$d_{5\ max.}$	b	Stripping unit lenght l 35	43	53	63	73
10	18	21	1,6	22	6	O	●	●	●	
13	23	26	3	26,5	6	O	●	●	●	●
16	28	31	3	34	6	O	●	●	●	●
20	33	36	3	38	7	O	●	●	●	●
25	40	43	3	47,6	7	O	●	●	●	●
32	50	55	3	57,9	7	O	●	●	●	●
38	60	65	3	69,6	8		O	O	O	O
40	60	65	3	69,6	8		●	●	●	O
						Punch lengths in use				
				Ball-lock punch, light duty		63	71	80	90	100
				Ball-lock punch, heavy duty		71	80	90	100	110
				Precision punch ISO 8020		-	71	80	90	100
				O = Special measures upon request						

Spring travel**	3 mm	6 mm	9 mm	3 mm	6 mm	9 mm	3 mm	6 mm	9 mm	3 mm	6 mm	9 mm	3 mm	6 mm	9 mm
Length	35	35	35	43	43	43	53	53	53	63	63	63	73	73	73
d_2	Stripping forces (N)*														
10	1300	-	-	1060	1820	-	900	1650	-	720	1450	1860	-	-	-
13	2100	-	-	1700	2850	-	1460	2610	-	1170	2320	2910	930	2080	2500
16	3000	-	-	2310	3900	-	1990	3560	-	1590	3150	3980	1270	2810	3440
20	3500	-	-	2900	4900	-	2500	4470	-	2000	3950	5000	1590	3420	4330
25	5400	-	-	4440	7520	-	3810	6860	-	3050	6050	7680	2420	5390	6780
32	8400	-	-	6840	11390	-	5880	10450	-	4700	9310	11640	3740	8370	10280
38	-	-	-	9280	19740	-	8140	15890	-	6440	11570	18030	5460	8850	11680
40	-	-	-	10100	20190	-	8650	17300	-	6890	13780	20670	6000	9800	12700

Ordering example:

Stripping unit	=	2431.7.
d_2 = 10 mm	=	10.
l = 53 mm	=	53
Order number	=	2431.7.10.53

Stripping unit - Pressure plate



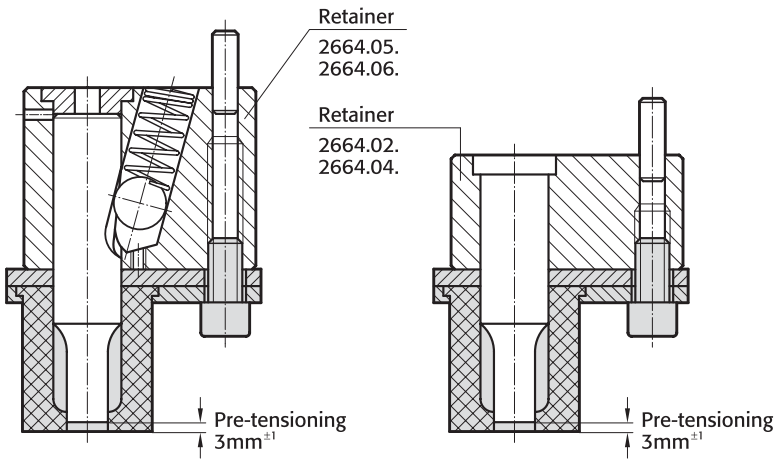
2667.1. Stripping unit - Pressure plate

Order No	d_2	R_1	a
2667.1.10	10	13	28
2667.1.13	13	15.5	31
2667.1.16	16	18	32.9
2667.1.20	20	20.5	34.8
2667.1.25	25	24	39.8
2667.1.32	32	31	41.3
2667.1.38	38	36	45
2667.1.40	40	36	45

Note:

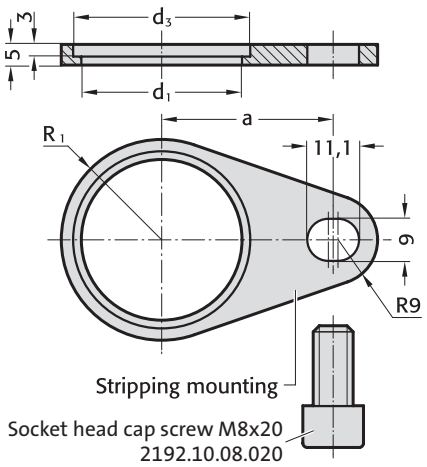
Pressure plate, mounting plate and screw must all be ordered individually.

Mounting example



Stripping unit - Mounting plate

2667.2.



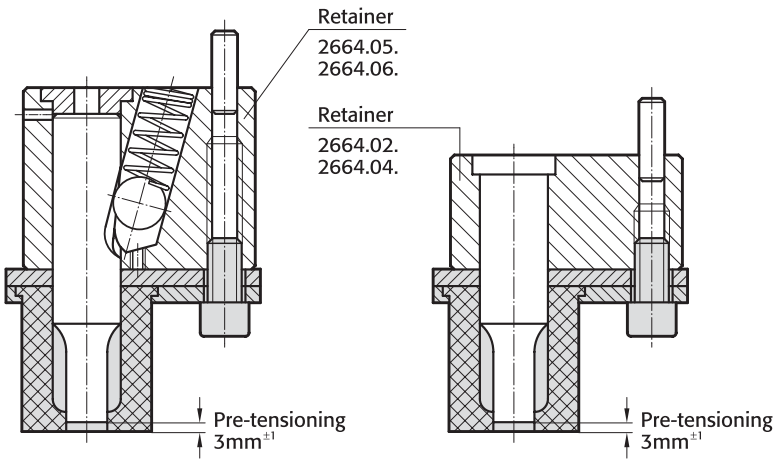
Note:

Pressure plate, mounting plate and screw must all be ordered individually.

2667.2. Stripping unit - Mounting plate

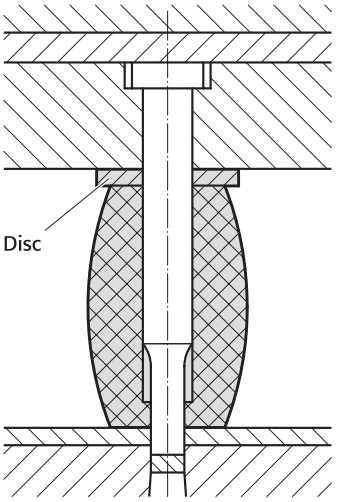
Order No	d_2	d_1	d_3	R_1	a
2667.2.10	10	19	22	13	28
2667.2.13	13	24	27	15.5	31
2667.2.16	16	29	32	18	32.9
2667.2.20	20	34	37	20.5	34.8
2667.2.25	25	41	44	24	39.8
2667.2.32	32	51	56	31	41.3
2667.2.38	38	61	66	36	45
2667.2.40	40	61	66	36	45

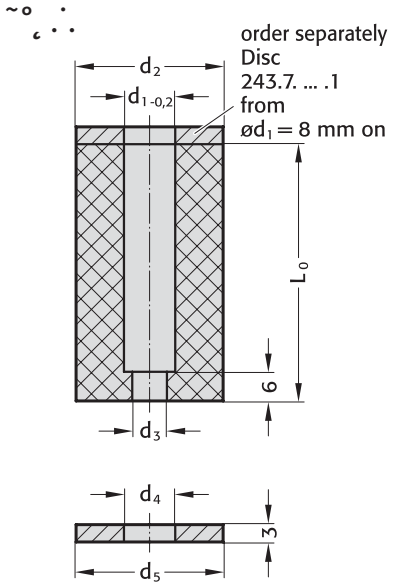
Mounting example



Elastomer Stripper

Mounting example





Description:

Repairs, sharpening and modifications on dies equipped with elastomer strippers do not necessitate the dismantling of a stripper plate, thus becoming very expedient.
Any marring of delicate part surfaces is precluded. This makes elastomer strippers ideal for all painted, anodized, plastic-coated and polished parts. FIBROFLEX® Elastomer Strippers are resistant against oils and greases.

Material:

FIBROFLEX®
Hardness: 95 Shore A

Execution:

Stock lenghts: 39, 47, 56 mm.
Other lengths on request (max. 56 mm)!

Application:

Especially in large dies, where the use of elastomer strippers does away with the need of huge stripper plates.

Mounting:

Push stripper over punch, where it will stay put on account of its elasticity.
No other form of retention will be required.
A single press stroke will then pierce a hole through the bottom portion of the stripper that matches the punch shape exactly.

243.7. Elastomer Stripper

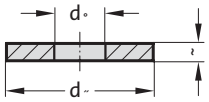
d_1	d_2	d_3	L_0	39	47	56
4	17	1.6		●	●	●
5	17	1.6		●	●	●
6	19	1.6		●	●	●
6.3	19	1.6		●	●	●
8	21	3		●	●	●
10	23	3		●	●	●
12.5	26	3		●	●	●
13	26	3		●	●	●
16	30	3		●	●	●
20	38	3		●	●	●
25	50	3		●	●	●
32	55	3		●	●	●
38	60	3		●	●	●
40	63	3		●	●	●

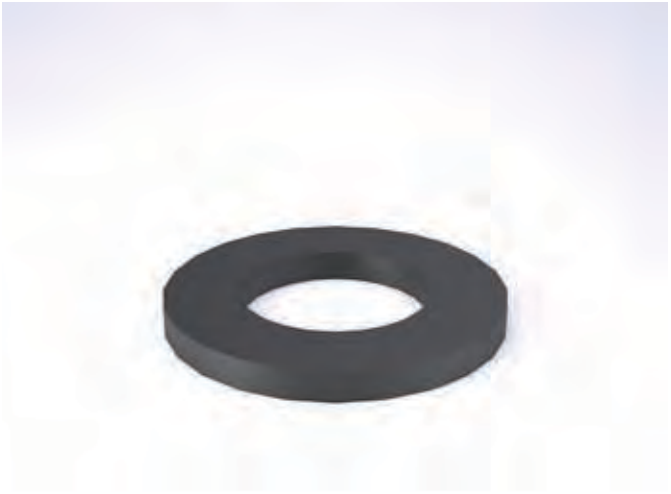
Ordering Code (example):

Elastomer Stripper		=	243.7.
Inside diameter d_1	4 mm	=	040.
Length L_0	39 mm	=	039
Order No		=	243.7. 040. 039

Washer

243.7. .1





Material:
Steel

243.7. .1 Washer

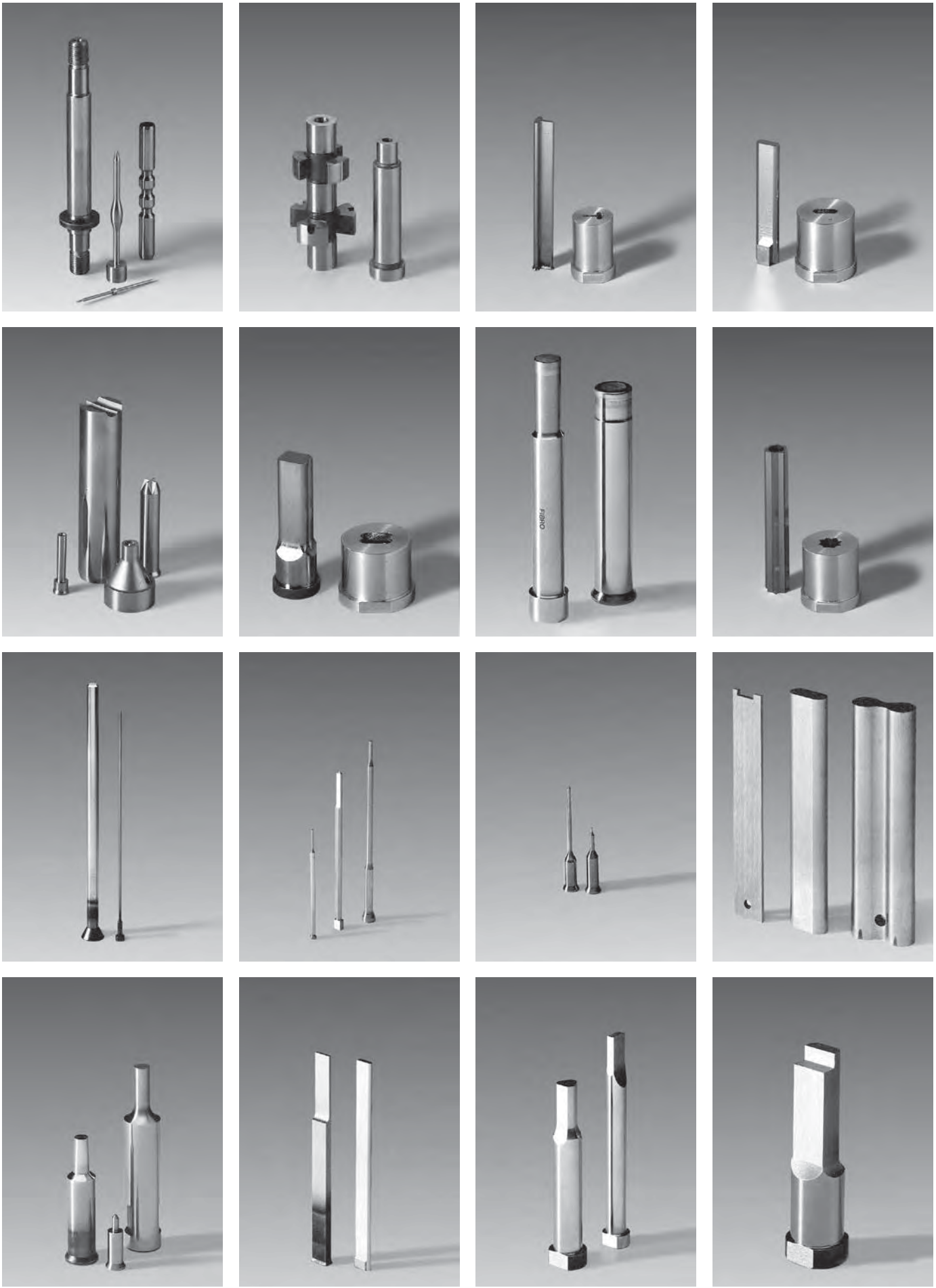
Order No	d_4	d_5
243.7.085.1	8.5	21
243.7.105.1	10.5	23
243.7.130.1	13	26
243.7.135.1	13.5	26
243.7.165.1	16.5	30
243.7.205.1	20.5	38
243.7.255.1	25.5	50
243.7.325.1	32.5	55
243.7.385.1	38.5	60
243.7.405.1	40.5	63

Special Punches, Custom made
High-Precision Special Parts to Customer´s Drawings

FIBRO manufactures Special Form Punches and -Matrices on most modern equipment. Projection Form Grinding, Creep Feed Grinding, EDM and Wire-EDM are used acc. to design details.

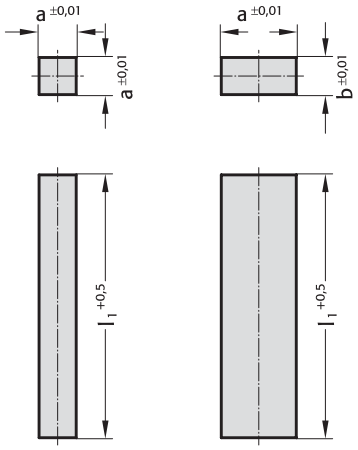
Many years of experience enable FIBRO to chose best suitable materials and methods.
We manufacture to customer´s drawings:

- Piercing Punches
- Draw Punched
- Form Punches
- Pre-Extrusion Punches and Ejectors for Bolt Manufacturing
- Flow-Forming Punches
- Punches with 30°-Conical Heads or other head shapes



Punch without head, square / rectangular, Shape A

230.



230. Punch without head, square / rectangular, Shape A

a	b	l_1	l*
1 - 8	1	73.5	71
2 - 10	2	73.5	71
3 - 12	3	73.5	71
4 - 12	4	73.5	71
5 - 15	5	73.5	71
6 - 20	6	73.5	71
7 - 24	7	73.5	71
8 - 24	8	73.5	71
9 - 28	9	73.5	71
10 - 34	10	73.5	71
12 - 34	12	73.5	71

*l = Nominal ordering length

Material:

HSS
Order No 230.3.
Hardness:
Shaft 64 ± 2 HRC

Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

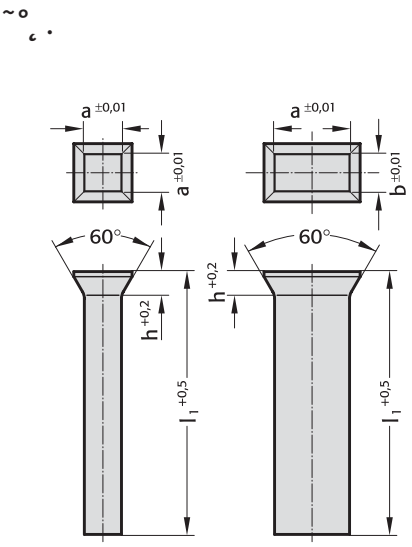
Punch shaft precision ground.

l_1: Stock length of square punches: 73,5 mm
Other materials and dimensions on request.

Ordering Code (example):

Punch without head, square / rectangular, Shape A		=	230.					
Material MAT	HSS	=		3.				
Punch cutting length a	1 mm	=			0100.			
Punch cutting width b	1 mm	=				0100.		
Nominal ordering length l	71	=					071	
Order No		=	230.	3.	0100.	0100.	071	

Punch with head, square / rectangular, Shape B



Material:

HSS
Order No 231.3.
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± HRC

Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

Punch shaft precision ground.
Heads hot upset forged - ground on special request.

l_1: Stock length of square punches: 71 mm
Other materials and dimensions on request.

231. Punch with head, square / rectangular, Shape B

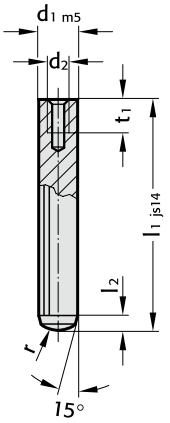
a	b	h	l_1
1 - 8	1	1.2	71
2 - 10	2	1.4	71
3 - 12	3	1.8	71
4 - 12	4	1.8	71
5 - 15	5	1.8	71
6 - 20	6	2	71
7 - 24	7	2.8	71
8 - 24	8	2.8	71
9 - 28	9	2.8	71
10 - 34	10	2.8	71
12 - 34	12	2.8	71

Ordering Code (example):

Punch with head, square / rectangular, Shape B		=	231.
Material MAT	HSS	=	3.
Punch cutting length a	1 mm	=	0100.
Punch cutting width b	1 mm	=	0100.
Length l_1	71 mm	=	071
Order No		=	231. 3. 0100. 0100. 071

DOWEL PIN WITH INTERNAL EXTRACTING THREAD, SIMILAR TO DIN EN ISO 8735

236.1.



Material:
Steel
Hardness 60 ± 2 HRC

Execution:
hardened and ground to finest finish
FIBRO Dowel Pins are manufactured with the exacting requirements of high class diemaking in mind. Whereas DIN EN ISO 8735 stipulates ISO Class 6 for dowels, we produce our pins to m5.

236.1. Dowel pin with internal extracting thread, similar to DIN EN ISO 8735

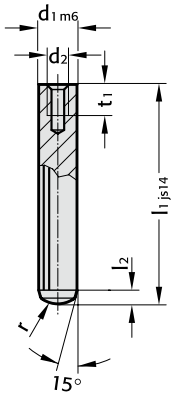
d_1	d_2	t_1	l_2	r	l_1	16	18	20	24	28	32	36	40	45	50	55	60	70	80	90	100	120
6	M4	6	2.1	6		●	●	●	●	●	●	●	●	●	●	●	●					
8	M5	8	2.6	8				●	●	●		●	●	●	●	●	●	●	●	●	●	
10	M6	10	3	10					●	●	●	●	●	●	●	●	●	●	●	●	●	
12	M6	12	3.8	12						●	●	●	●	●	●	●	●	●	●	●	●	●
14	M8	12	4	16							●	●	●	●	●	●	●	●	●	●	●	●
16	M8	16	4.7	16							●	●	●	●	●	●	●	●	●	●	●	●
20	M10	20	6	20								●	●	●	●	●	●	●	●	●	●	●
25	M16	24	6	25										●	●	●	●	●	●	●	●	●

Ordering Code (example):

Dowel pin with internal extracting thread, similar to DIN EN ISO 8735		=	236.1.
Diameter d_1	14 mm	=	1400.
Length l_1	32 mm	=	032
Order No		=	236.1. 1400. 032

DOWEL PIN WITH INTERNAL EXTRACTING THREAD, ACCORDING TO DIN EN ISO 8735

2361.1.



Material:
Steel
Hardness 60 ± 2 HRC

Execution:
hardened and ground to finest finish

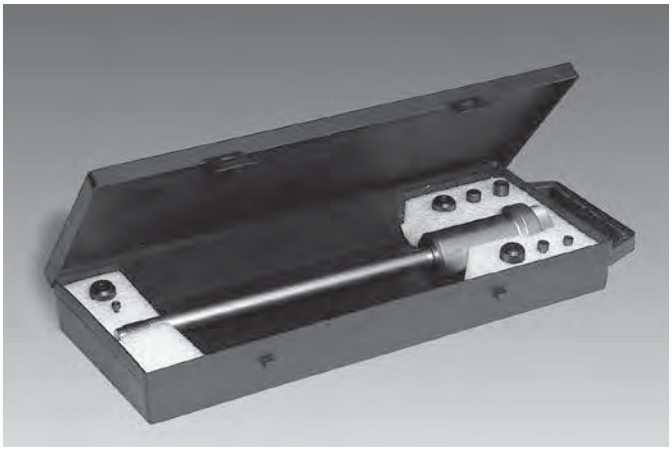
2361.1. Dowel pin with internal extracting thread, according to DIN EN ISO 8735

d_1	d_2	t_1	l_2	r	l_1	8	10	12	14	16	18	20	22	24	26	28	30	32	36	40	45	50	55	60	70	80	90	100	120
4	M2,5	4.5	1.3	4			●	●	●	●	●	●		●		●	●	●	●	●		●							
5	M3	5	1.7	5		●	●	●	●	●	●	●		●		●	●	●	●	●	●	●	●	●					
6	M4	6	2.1	6				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
8	M5	8	2.6	8						●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
10	M6	10	3	10						●	●	●		●		●	●	●	●	●	●	●	●	●	●	●	●	●	●
12	M6	10	3.8	12								●		●		●	●	●	●	●	●	●	●	●	●	●	●	●	●
14	M8	12	4	14												●		●	●	●	●	●	●	●	●	●	●	●	●
16	M8	12	4.7	16														●	●	●	●	●	●	●	●	●	●	●	●
20	M10	16	6	20															●	●	●	●	●	●	●	●	●	●	●

Ordering Code (example):

Dowel pin with internal extracting thread, according to DIN EN ISO 8735		=	2361.1.
Diameter d_1	10 mm	=	1000.
Length l_1	16 mm	=	016
Order No		=	2361.1. 1000. 016

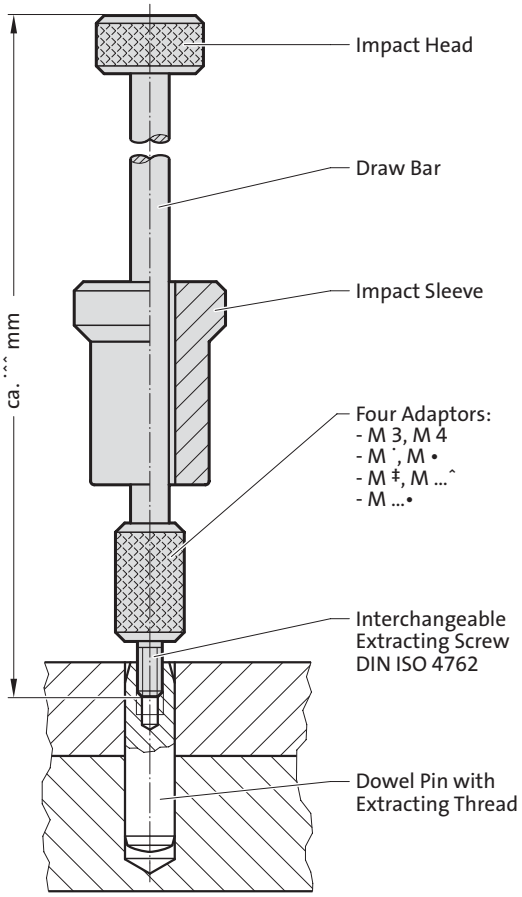
FIBROZIPP



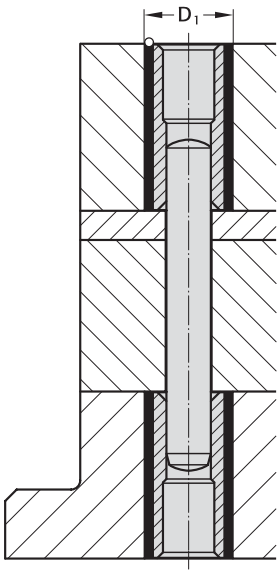
236.001 Do wel Pin Extractor FIBROZIPP

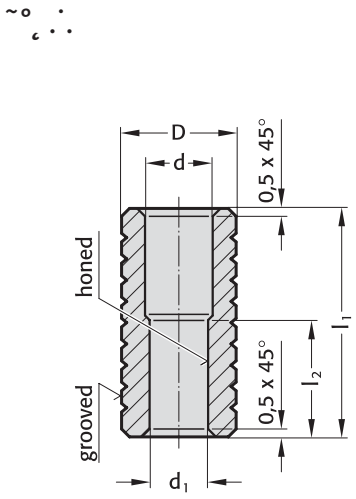
Extraction tool for the fast and convenient removal of dowels with internal extracting thread – also for shafts, plugs and other machine components.

The tool comes with interchangeable adaptors and screws, to fit all threads from M3 to M16.



Liner bush for dowel pin, for bonding





Description:

Dowel liner bushes are used where precisely positioned, unhardened parts are often changed or must be replaced, e.g. in precision tool construction.

Material:

WS
Hardness 54 ± 2 HRC

Epoxy-Bonding:

The jig-ground pin holes of the hardened matrix are joined with the dowel liner bush by means of a dowel pin 235.1. Retainer holes for dowel liner bushes should be approximately 2 mm larger in diameter than the bush O.D. – a coarse finish is desirable. Following exact positioning/aligning, FIBROLIT® ZWO or FIBROFIX® SECHS is used for bonding.

265.1. Liner bush for dowel pin, for bonding

d_1	d	D	D_1	l_1	l_2
6	7	10	12	25	12
8	9	12	14	30	16
10	11	16	18	36	20

Ordering Code (example):

One Dowel Liner Bush – only –

Dowel Liner Bush	= 265.
Material: Tool Steel	= 1.
d_1 = ∅ 8,0 mm	= 0800.
Quantity: one	= 1
Order No	= 265.1.0800.1

Ordering Code (example):

One Dowel Liner Bush + Matching Dowel

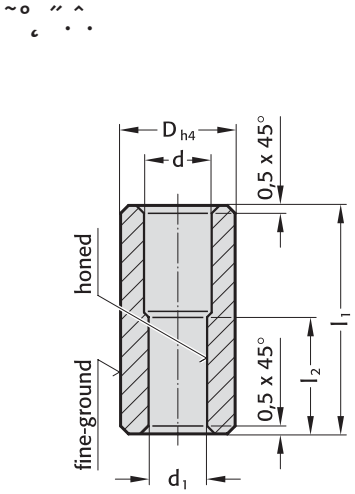
Dowel Liner Bush	= 265.
Material: Tool Steel	= 1.
d_1 = ∅ 8,0 mm	= 0800.
Quantity: one	= 1.
Dowel: length = 40 mm	= 040
Order No	= 265.1.0800.1.040

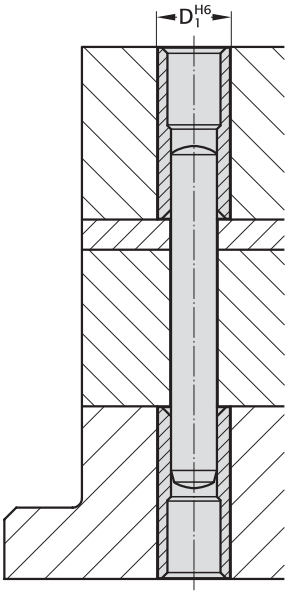
Ordering Code (example):

Two Dowel Liner Bushes + one Dowel

Dowel Liner Bush	= 265.
Material: Tool Steel	= 1.
d_1 = ∅ 8,0 mm	= 0800.
Quantity: two	= 2.
Dowel: length = 50 mm	= 050
Order No	= 265.1.0800.2.050

Liner bush for dowel pin, for push fit





Description:

Dowel liner bushes are used where precisely positioned, unhardened parts are often changed or must be replaced, e.g. in precision tool construction.

Material:

WS
Hardness 54 ± 2 HRC

Slip-Fit Bonding:

The position of the bush is given by push fit hole tolerance H6. The adhesive (order no. 281.648) provides optimum push retention whilst offering the following
advantages:
- high accuracy and stiffness
- no problems to find position when changing bushings

We do not recommend to press fit bushings.

2650.1. Liner bush for dowel pin, for push fit

d_1	d	D	l_1	l_2
6	7	10	25	12
8	9	12	30	16
10	11	16	36	20

Ordering Code (example):

One Dowel Liner Bush – only –

Dowel Liner Bush	= 2650.
Material: Tool Steel	= 1.
d_1 = ∅ 8,0 mm	= 0800.
Quantity: one	= 1
Order No	= 2650.1.0800.1

Ordering Code (example):

One Dowel Liner Bush + Matching Dowel

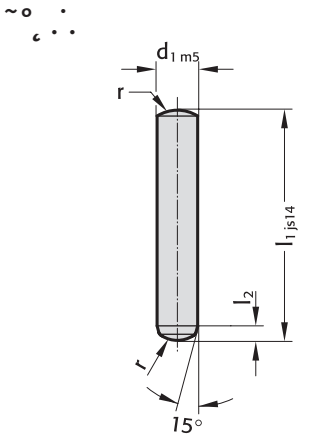
Dowel Liner Bush	= 2650.
Material: Tool Steel	= 1.
d_1 = ∅ 8,0 mm	= 0800.
Quantity: one	= 1.
Dowel: length = 40 mm	= 040
Order No	= 2650.1.0800.1.040

Ordering Code (example):

Two Dowel Liner Bushes + one Dowel

Dowel Liner Bush	= 2650.
Material: Tool Steel	= 1.
d_1 = ∅ 8,0 mm	= 0800.
Quantity: two	= 2.
Dowel: length = 50 mm	= 050
Order No	= 2650.1.0800.2.050

DOWEL PIN SIMILAR TO DIN EN ISO 8734



Material:
Steel
Hardness 60 ± 2 HRC

Execution:
hardened and ground to finest finish
FIBRO Dowel Pins are manufactured with the exacting requirements of high class diemaking in mind. Whereas DIN EN ISO 8734 stipulates ISO Class 6 for dowels, we produce our pins to m5.

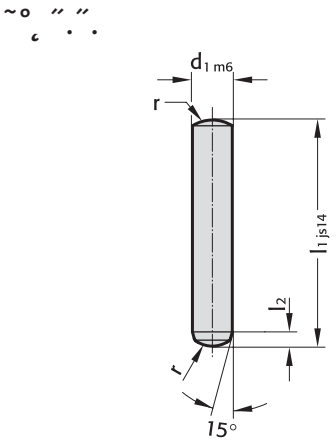
235.1. Dowel pin similar to DIN EN ISO 8734

d_1	l_2	r	l_1	6	8	10	12	14	16	18	20	24	28	32	36	40	45	50	55	60	70	80	90	100	120	130	140
1	0.48	1			●	●	●																				
1.5	0.62	1.6		●	●	●	●	●	●																		
2	0.78	2		●	●	●	●	●	●	●	●	●	●	●													
2.5	0.95	2.5		●	●	●	●	●	●	●	●	●	●	●	●												
3	1.1	3		●	●	●	●	●	●	●	●	●	●	●	●	●	●										
4	1.4	4		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●							
5	1.7	5			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					
6	2.1	6				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
8	2.6	8				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
10	3	10							●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
12	3.8	12									●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
14	3.8	16													●	●	●	●	●	●	●	●	●	●	●		
16	4.7	16														●	●	●	●	●	●	●	●	●	●		●
20	6	20																	●	●	●	●	●	●	●		●

Ordering Code (example):

Dowel pin similar to DIN EN ISO 8734		= 235.1.	
Diameter d_1	6 mm	= 0600.	
Length l_1	10 mm	=	010
Order No		= 235.1. 0600.	010

Dowel pin according to DIN EN ISO 8734



Material:
Steel
Hardness 60 ± 2 HRC

Execution:
hardened and ground to finest finish

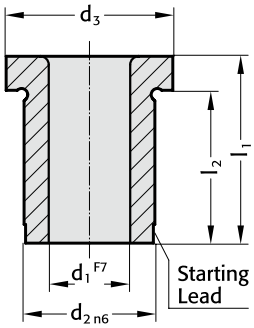
2351.1. Dowel pin according to DIN EN ISO 8734

d_1	l_2	r	l_1	4	5	6	8	10	12	14	16	18	20	22	24	26	28	30	32	36	40	45	50	55	60	70	80	90	100	120
1	0.4	1		●	●	●	●	●	●																					
1.5	0.5	1.6		●	●	●	●	●	●	●	●		●	●	●															
2	0.6	2		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●									
2.5	0.7	2.5			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●											
3	0.8	3			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●					
4	1	4				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●			
5	1.2	5					●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
6	1.5	6					●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
8	1.8	8								●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
10	2	10									●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
12	2.5	12											●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
14	2.5	16													●		●	●	●	●	●	●	●	●	●	●	●	●	●	
16	3	16													●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
20	4	20																		●	●	●	●	●	●	●	●	●	●	

Ordering Code (example):

Dowel pin according to DIN EN ISO 8734		=	2351.1.		
Diameter d_1	1 mm	=		0100.	
Length l_1	4 mm	=			004
Order No		=	2351.1.	0100.	004

DRILL BUSH WITH COLLAR, DIN 172 SHAPE A



Material:
Case hardened steel
Hardness 740 ± 40 HV 10

Execution:
Diameters d_1, d_2 and shoulder precision ground.

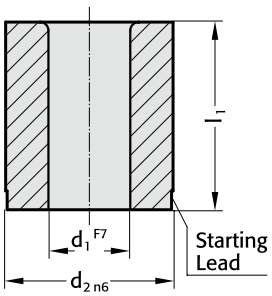
276. Drill bush with collar, DIN 172 Shape A

d_1	d_2	d_3	Gradation	l_1	6	8	9	10	12	16	20	25	28	30	36	45	56	67
0,9 - 1	3	6	0.1	l_2	4		7											
1,1 - 1,8	4	7	0.1		4		7											
1,9 - 2,6	5	8	0.1		4		7											
2,7 - 3,3	6	9	0.1			5.5			9.5	13.5								
3,4 - 4	7	10	0.1			5.5			9.5	13.5								
4,1 - 5	8	11	0.1			5.5			9.5	13.5								
5,1 - 6	10	13	0.1					7		13	17							
6,1 - 8	12	15	0.1					7		13	17							
8,1 - 10	15	18	0.1						9		17	22						
10,1 - 12	18	22	0.1						8		16	21						
12,1 - 15	22	26	0.1							12			24		32			
15,5 - 18	26	30	0.5							12			24		32			
18,5 - 22	30	34	0.5								15				31	40		
22,5 - 26	35	39	0.5								15				31	40		
26,5 - 30	42	46	0.5									20				40	51	
30,5 - 35	48	52	0.5									20				40	51	
35,5 - 42	55	59	0.5											25			51	62

Ordering Code (example):

Drill bush with collar, DIN 172 Shape A		=	276.1.
diameter of conduit d_1	12.1 mm	=	1210.
Length l_1	16 mm	=	016
Order No		=	276.1. 1210.016

DRILL BUSH WITHOUT COLLAR, DIN 179 SHAPE A



Material:
Case hardened steel
Hardness 740 ± 40 HV 10

Execution:
Diameters d_1 and d_2 precision ground.

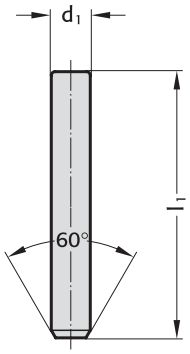
277. Drill bush without collar, DIN 179 Shape A

d_1	d_2	Gradation	l_1	6	8	9	10	12	16	20	25	28	30	36	45	56	67
0,9 - 1	3	0.1		●		●											
1,1 - 1,8	4	0.1		●		●											
1,9 - 2,6	5	0.1		●		●											
2,7 - 3,3	6	0.1			●			●	●								
3,4 - 4	7	0.1			●			●	●								
4,1 - 5	8	0.1			●			●	●								
5,1 - 6	10	0.1					●		●	●							
6,1 - 8	12	0.1					●		●	●							
8,1 - 10	15	0.1						●		●	●						
10,1 - 12	18	0.1						●		●	●						
12,1 - 15	22	0.1							●			●		●			
15,5 - 18	26	0.5							●			●		●			
18,5 - 22	30	0.5								●				●	●		
22,5 - 26	35	0.5								●				●	●		
26,5 - 30	42	0.5									●				●	●	
30,5 - 35	48	0.5									●				●	●	
35,5 - 42	55	0.5											●			●	●
42,5 - 48	62	0.5											●			●	●

Ordering Code (example):

Drill bush without collar, DIN 179 Shape A		=	277.1.
diameter of conduit d_1	12.1 mm	=	1210.
Length l_1	16 mm	=	016
Order No		=	277.1. 1210.016

Gauge pin DIN 2269



Material:

Alloy tool steel, hardened and tempered.
Age-treated repeatedly.
Hardness 60 ± 2 HRC

Execution:

precision ground
Quality class I: diameter tolerance ±0,001
Quality class II: diameter tolerance ±0,002

Single pins:
Quality class I 240.1.
Quality class II 240.2.

Small set:
91 gauge pins from Ø 1-10 mm in steps of 0,1 mm, complete in wooden box.
Quality class I 240.51.
Quality class II 240.52.

Large set:
273 gauge pins from Ø 1-10 mm in steps of 0,1 mm, plus one each. 0,01 mm-oversize/ undersize pin – complete in wooden box
Quality class I 240.41.
Quality class II 240.42.

Special sets:
Supplied to customer's requirements in respect of assortment and quality class. All gauge pins from Ø 3 mm upward are marked with their actual size.

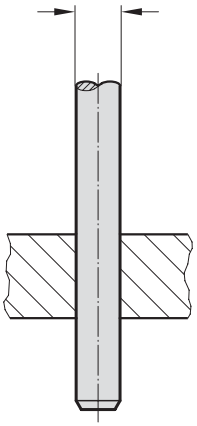
Ordering Code (example):

Gauge pin DIN 2269		=240.	
Quality class KL	1	=	1.
Diameter d_1	0.29 mm	=	0029
Order No		=240.	1. 0029

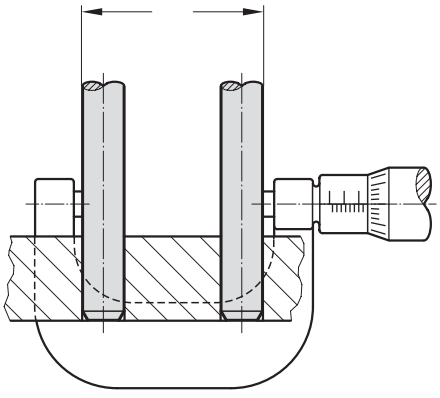
240.1./2. Gauge pin DIN 2269

d_1	l_1
0.29 - 6	50
6.01 - 20	70

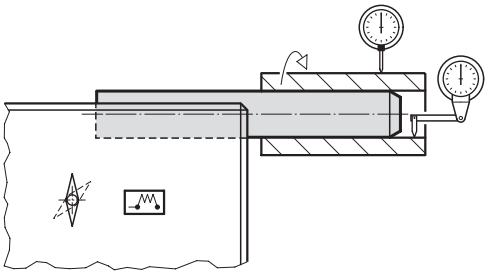
Direct gauging of bore diameters



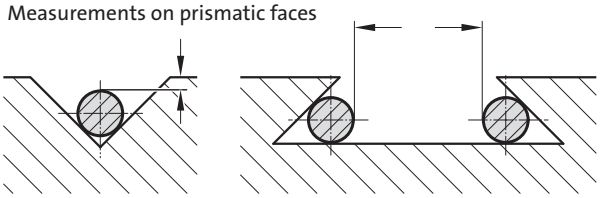
Measurement of centre-distance between two bores



Concentricity check on a bush

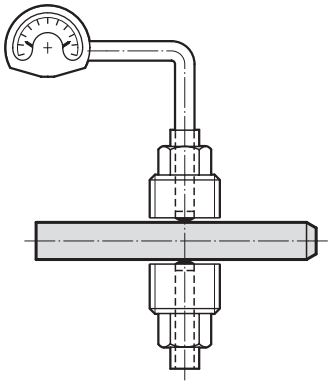


Measurements on prismatic faces

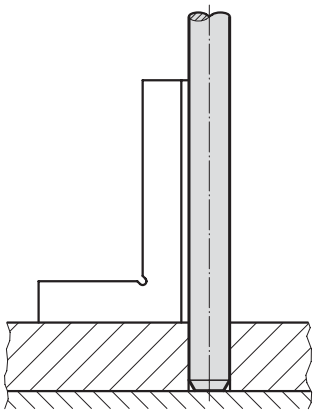


Gauge Pin Holders
Wooden Boxes

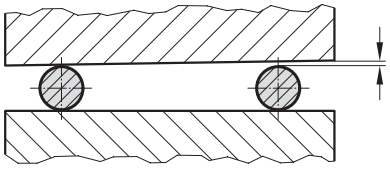
Calibration of a comparator



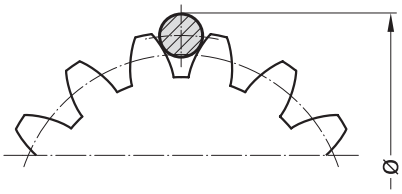
Inspection for squareness of a bore



Check on parallelism



Measuring of gear teeth, threads etc.



240.45. Gauge Pin Holders

(without pins)	for diameters	Order No
	from 1 –2	240.45.1
	from 2 –4	240.45.2
	from 4 –6	240.45.3
	from 6 –8	240.45.4
	from 8 –10	240.45.5

Gauge Pin Holders are double-ended, to carry two pins e.g. for go – no go measurements etc.

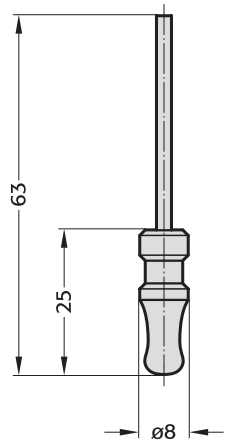
Wooden boxes: (without pins)	with drilled holes, for the safe and orderly storage of gauge pins – each hole marked with the requisite pin size.	Order No
	Large Set of approx. 270 Pins size: 250 ×90×390	240.91
	Small Set of approx. 90 Pins size: 155 ×90×285	240.92
	Boxes complete with carrier board inset	
	Class I-Accuracy	240.9x.1
	Class II-Accuracy	240.9x.2

Ordering code (example):

Gauge pin box – approx. 270 pins	= 240.91.
Class I-Accuracy	= 1
Order No	= 240.91.1

High Precision Gauge Pin with Handle
High Precision Gauge Pins – Boxed Sets

240.11./22.



240.11./22. High-Precision Gauge Pin with Handle

The Gauge Pins are firmly fixed to the handle. Each Pin is marked with its true diameter.

Single Gauge Pins:	∅ 0,3 – 3,0 mm, In dia. steps of 0.01 mm	Order No
	Class I-Accuracy	240.11.
	Class II-Accuracy	240.22.
Assortment:	84 Gauge Pins from 0.3 – 3.0 mm, in dia. steps of 0.1 mm plus one each pin with undersize 0.01 and oversize 0.01 mm (for example 0.29 – 0.30 – 0.31 etc.)	
	Class I-Accuracy	240.31
	Class II-Accuracy	240.32
Special Assortments:	to customer's specifications in respect of class of accuracy	

Material:

Alloy tool steel, hardened and tempered.
Repeatedly age-treated.
Hardness 60 ± 2 HRC.
fine-ground
Class II-Accuracy ±0.001
Class II-Accuracy ±0.002
to DIN 2269

Ordering Code (example):

Gauge Pin	= 240.	
Class I-Accuracy, with handle	=	11.
d_1 = 1,5 mm	=	0150
Order No	= 240.11.0150	

Wooden box:

Wooden boxes for Gauge Pins – with drilled holes in wooden tray insert. Each hole marked with true size of pin.

External dimensions: 155x90x285 mm

Punching and embossing unit with matrix for punched holes and self tapping screws

Material:
HSS

Execution:
The punching and embossing unit with matrix consists of:
1 x embossing die
1 x punch die
1 x matrix

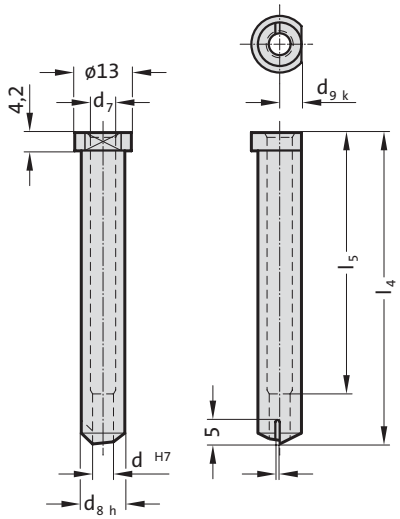
Sheet metal thickness:
max. 0,6 mm = 2282.01.035/039
max. 0,8 mm = 2282.01.042
max. 0,9 mm = 2282.01.048
max. 1,0 mm = 2282.01.055/063

2282.01. Punching and embossing unit with matrix for punched holes and self tapping screws

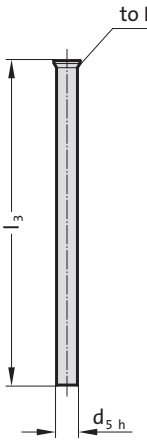
Order No	Nominal-Ø = thread size	d_1	d_2	d_{3h6}	d_{4k6}	d_{5h6}	d_6	d_7	d_{8h6}	d_{9k6}	l_1	l_2	l_3	l_4	l_5
2282.01.035	B 3,5	2.75	3.2	7.5	3.75	2.7	2.7	3.1	7.5	3.75	31.3	28	74.5	71.5	60
2282.01.039	B 3,9	3.05	3.4	7.5	3.75	3	3	3.6	7.5	3.75	31.3	28	74.5	71.5	60
2282.01.042	B 4,2	3.15	3.5	8.5	4.25	3.1	3.1	3.7	8	4	31.3	28	74.5	71.5	60
2282.01.048	B 4,8	3.85	4.2	9	4.5	3.8	3.8	4.5	8	4	31.3	28	74.5	71.5	60
2282.01.055	B 5,5	4.35	4.8	9	4.5	4.3	4.3	5	8	4	31.3	28	74.5	71.5	60
2282.01.063	B 6,3	4.85	5.3	10.5	5.25	4.8	4.8	5.5	10	5	31.3	28	74.5	71.5	60

2282.01.xxx

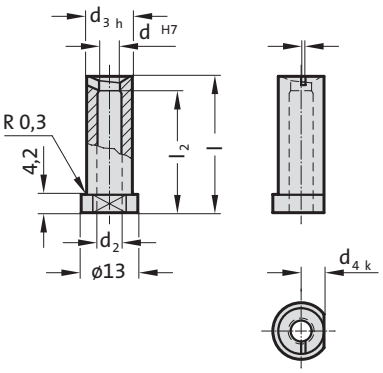
2282.01.xxx. Embossing die



2282.01.xxx.2 Punch die



2282.01.xxx.3 Bottom die



Example of application: