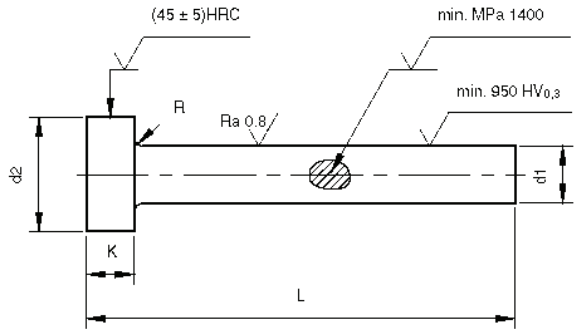
Straight Ejector Pins

MATERIAL: WAS 1.2344 Hotwork Die Steel

STANDARD: DIN 1530-A/ISO 6751

HARDNESS: Surface: Nitrided to ≧ HV 950° and Bright polished

Core: Hardened throughout to ≧ 1400N/mm^2



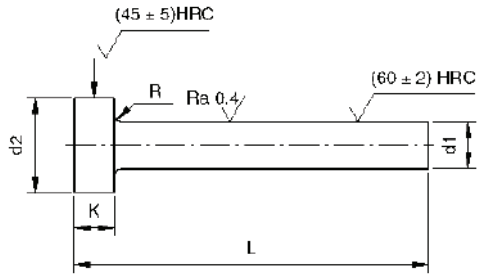
d1 g6	d2 -0.2	K -0.05	R	L1+2 100	125	160	200	250	315	400	500	630	800	1,000
1.5	3	1.5	0.2											
2.0	4	2.0												
2.2														
2.5	5		0.3											
2.7														
3.0	6	3.0												
3.2														
3.5	7													
3.7														
4.0	8													
4.2														
4.5														
5.0	10													
5.2														
5.5														
6.0	12	5.0	0.5											
6.2														
6.5														
7.0														
8.0	14													
8.2														
8.5														
9.0														
10.0	16													
10.2														
10.5														
11.0														
12.0	18,20	7.0	0.8											
12.2														
12.5														
14.0	22													
16.0														
18.0	24		1.0											
20.0	26	8.0												
25.0	32	10.0												
32.0	40													

Straight Ejector Pins

MATERIAL: WS 1.2210 Through Hardened Steel

STANDARD: DIN 1530-AH

HARDNESS: Surface: Throughout hardened to 60±2 HRC



d1 g6	d2 -0.2	K -0.05	R	L1+2 100	125	160	200	250	315	400	500	630	800	1,000
1	2.5	1.2	0.2											
1.1														
1.2														
1.3	3	1.5												
1.4														
1.5														
1.6														
1.7														
1.8														
1.9														
2	4	2												
2.2														
2.5	5		0.3											
2.7														
3	6	3												
3.2														
3.5	7													
3.7														
4	8													
4.2														
4.5														
5	10													
5.2														
5.5														
6	12	5	0.5											
6.2														
6.5														
7														
7.5														
8	14													
8.2														
8.5														
9														
10	16													
10.2														
10.5														
11														
12	18,20	7	0.8											
12.2														
12.5														
13	20													
14	22													
14.5														
16			1											
18	24													
20	26	8												
25	32	10												
32	40													

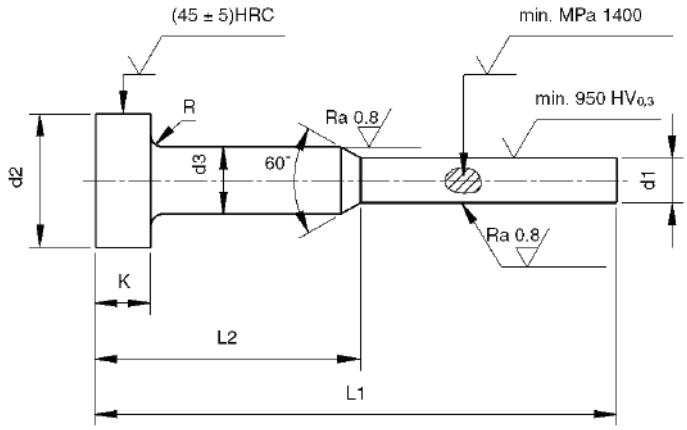
Shouldered Ejector Pins

MATERIAL: WAS 1.2344 Hotwork Die Steel

STANDARD: DIN 1530-C/ISO 8694

HARDNESS: Surface: Nitrided to ≧ HV 950°

Core: Hardened throughout to ≧ 1400N/mm²



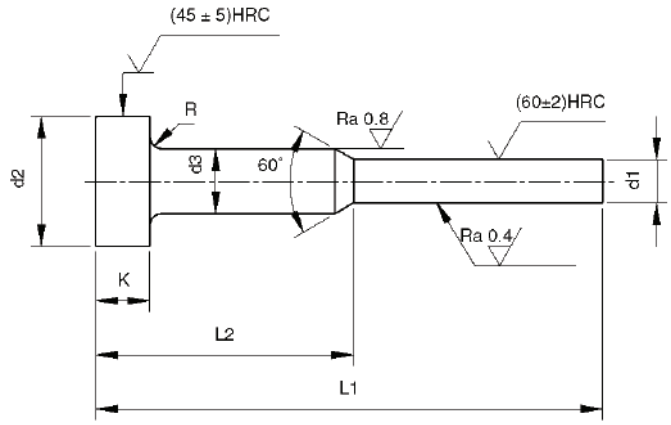
d1 g6	d3 –0.1	d2 –0.2	K –0.05	L1 / L2						
				80 / 35	100 / 50	125 / 50	150 / 50	160 / 75	200 / 75	250 / 100
0.8	2.0	4.0	2.0							
0.9										
1.0										
1.1										
1.2										
1.3										
1.4										
1.5	3.0	6.0	3.0							
1.6										
1.7										
1.8										
1.9										
2.0										
2.1										
2.2										
2.3										
2.4										
2.5										
2.6										
2.7										
2.8										
2.9										

Shouldered Ejector Pins

MATERIAL: WS 1.2210 Through Hardened Steel

STANDARD: DIN 1530-CH/ISO 8694

HARDNESS: Surface: Throughout hardened to 60±2 HRC



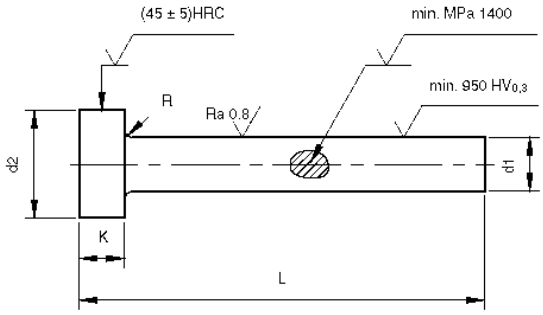
d1 g6	d3 –0.1	d2 –0.2	K –0.05	L1 / L2						
				80 / 35	100 / 50	125 / 50	150 / 50	160 / 75	200 / 75	250 / 100
0.8	2.0	4.0	2.0							
0.9										
1.0										
1.1										
1.2										
1.3										
1.4										
1.5	3.0	6.0	3.0							
1.6										
1.7										
1.8										
1.9										
2.0										
2.1										
2.2										
2.3										
2.4										
2.5										
2.6										
2.7										
2.8										
2.9										

Straight Core pin

MATERIAL: WAS 1.2344 Hotwork Die Steel

STANDARD: DIN 1530 / ISO 6751

HARDNESS: Hardened throughout to 41 – 45 HRC



	d1 g6	d2 -0.2	K -0.05	R	L+2											
					63	80	100	125	160	200	250	315	400	500	630	800
	1 5	3	1 5	0 2												
	2 0	4	2 0	0 2												
	2 2	4	2 0	0 2												
	2 5	5	2 0	0 3												
	2 7	5	2 0	0 3												
	3 0	6	3 0	0 3												
	3 2	6	3 0	0 3												
	3 5	7	3 0	0 3												
	3 7	7	3 0	0 3												
	4 0	8	3 0	0 3												
	4 2	8	3 0	0 3												
	4 5	8	3 0	0 3												
	5 0	10	3 0	0 3												
	5 2	10	3 0	0 3												
	5 5	10	3 0	0 3												
	6 0	12	5 0	0 5												
	6 2	12	5 0	0 5												
	6 5	12	5 0	0 5												
	7 0	12	5 0	0 5												
	7 5	12	5 0	0 5												
	8 0	14	5 0	0 5												
	8 2	14	5 0	0 5												
	8 5	14	5 0	0 5												
	3 0	14	5 0	0 5												
	3 5	14	5 0	0 5												
	10 0	16	5 0	0 5												
	10 2	16	5 0	0 5												
	10.5	16	5 0	0 5												
	11.0	16	5 0	0 5												
	12.0	18	7 0	0 8												
	12.2	18	7 0	0 8												
	12.5	18	7 0	0 8												
	14.0	22	7 0	0 8												
	16.0	22	7 0	0 8												
	18.0	24	7 0	0 8												
	20.0	26	8 0	1 0												

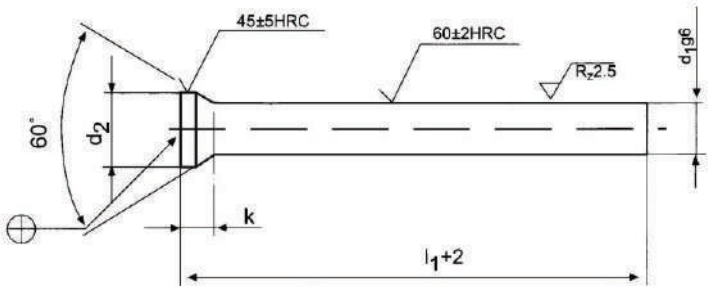
Ejector Pins – Conical Head

MATERIAL: WS 1.2210 Through Hardened Steel

STANDARD: DIN 1530-D

HARDNESS: Shaft: 60±2 HRC

Head: 45±5 HRC



d1 g6	**d2** -0.2	**K** +0.2	**L1**+2 100	125	160	200	250	315	400	500	630	800	1,000
1.0	1.8	1.2											
1.1		1.1											
1.2	2	1.2											
1.25		1.15											
1.3		1.11											
1.4	2.2	1.2											
1.5		1.11											
1.6	2.5	1.3											
1.7		1.2											
1.75	2.8	1.15											
1.8		1.4											
1.9		1.3											
2.0	3	1.4											
2.1	3.2	1.5											
2.2		1.4											
2.25		1.32											
2.3	3.5	1.54											
2.4		1.45											
2.5		1.4											
2.6	4	1.7											
2.7		1.6											
2.75		1.58											
2.8		1.54											
2.9		1.45											
3.0	4.5	1.8											
3.1		1.7											
3.2		1.63											
3.25		1.58											
3.3		1.7											
3.4		1.7											
3.5	5	1.8											
3.6		1.7											
3.7		1.7											
3.75		1.58											
3.8		1.7											
3.9		1.7											

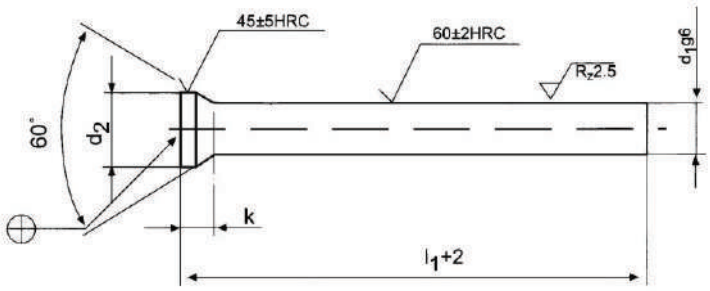
Ejector Pins – Conical Head

MATERIAL: WS 1.2210 Through Hardened Steel

STANDARD: DIN 1530-D

HARDNESS: Shaft: 60±2 HRC

Head: 45±5 HRC



d1 g6	d2 -0.2	K +0.2	L1+2 100	125	160	200	250	315	400	500	630	800	1,000
4.0	5.5	1.7											
4.1		1.8											
4.2													
4.25													
4.4													
4.5	6	1.8											
4.6		1.7											
4.75													
5.0	6.5	1.8											
5.1		1.7											
5.2													
5.25													
5.3													
5.4													
5.5	7	1.8											
5.6													
5.75													
6	8	2.2											
6.2													
6.5	9	3.2											
7.0		2.7											
7.5	10	3.2											
8.0		2.7											
8.2													
8.5	11	3.2											
9.0		2.7											
10.0	12												
12.0	14												
14.0	16	3.2											
16.0	18												

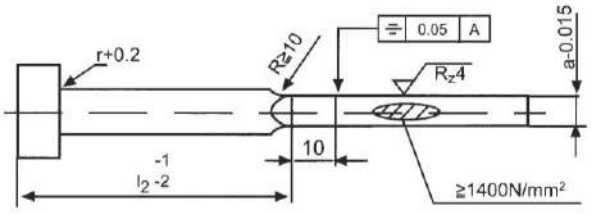
Flat Ejector Pins

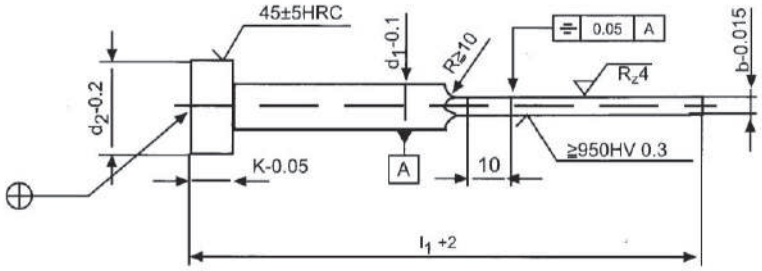
MATERIAL: WAS 1.2344 Hotwork Die Steel

STANDARD: DIN 1530-F/ISO 8693

HARDNESS: Surface: Nitrided to ≧ 950° HV

Core: Hardened throughout to ≧ 1400N/mm^2





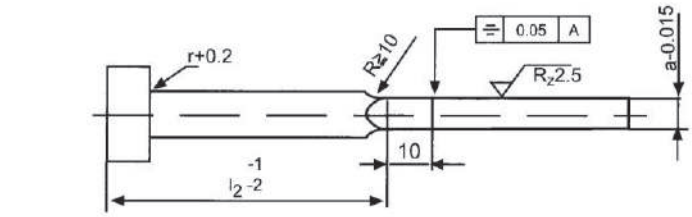
a -0.015	b -0.015	d1 -0.1	d2 -0.2	K -0.05	r	L1/L2								
						60/30	80/40	100/50	125/60	160/80	200/100	250/125	315/160	400/200
3.8	0.8	4.2	8	3	0.3									
	1.0													
	1.2													
4.5	1.0	5	10											
	1.2													
	1.5													
5.5	1.0	6	12	5	0.5									
	1.2													
	1.5													
	2.0													
7.5	1.2	8	14											
	1.5													
	2.0													
9.5	1.5	10	16											
	2.0													
11.5	2.0	12	20	7	0.8									
	2.5													
15.5	2.0	16	22											
	2.5													

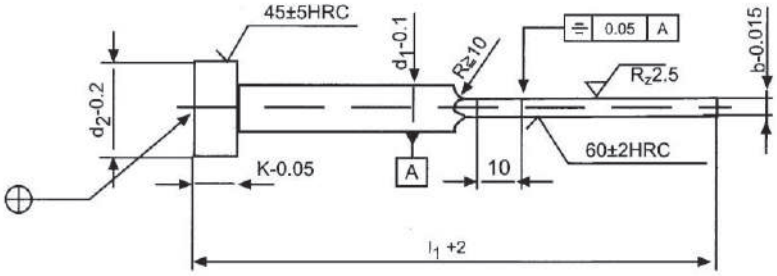
Flat Ejector Pins

MATERIAL: WS 1.2210 Through Hardened Steel

STANDARD: DIN 1530-FH/ISO 8693

HARDNESS: Throughout hardened to 60±2 HRC





a -0.015	b -0.015	d1 -0.1	d2 -0.2	K -0.05	r	L1/L2							
						60/30	80/40	100/50	125/60	160/80	200/100	250/125	315/160
3.8	0.8	4.2	8	3	0.3								
	1.0												
	1.2												
4.5	1.0	5	10										
	1.2												
	1.5												
5.5	1.0	6	12	5	0.5								
	1.2												
	1.5												
	2.0												
7.5	1.2	8	14										
	1.5												
	2.0												
9.5	1.5	10	16										
	2.0												
11.5	2.0	12	20	7	0.8								
	2.5												
15.5	2.0	16	22										
	2.5												

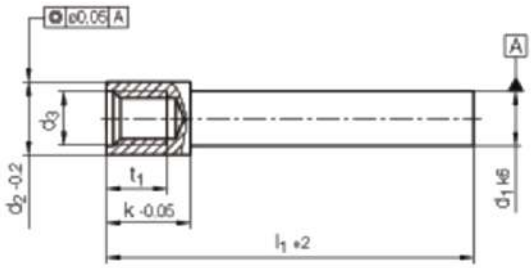
Threaded Ejector Pins

MATERIAL: WAS 1.2344 Hotwork Die Steel

STANDARD: DIN 1530-A / ISO 6751

HARDNESS: Surface: Nitrided to ≧ HV 950° and Bright polished

Core: Hardened throughout to ≧ 1400N/mm2



d2	d3	t	k	d1	11
6	M4	5	10	3.	63
					125
				3.5	63
					125
8	M5	7	12	4	63
					125
				4.5	63
					125
9	M6	9	14	5	80
					160
				5.5	80
					160
10	M6	9	14	6	80
					160
				6.5	80
					160
13	M8	10	16	8	80
					160
				8.5	80
					160

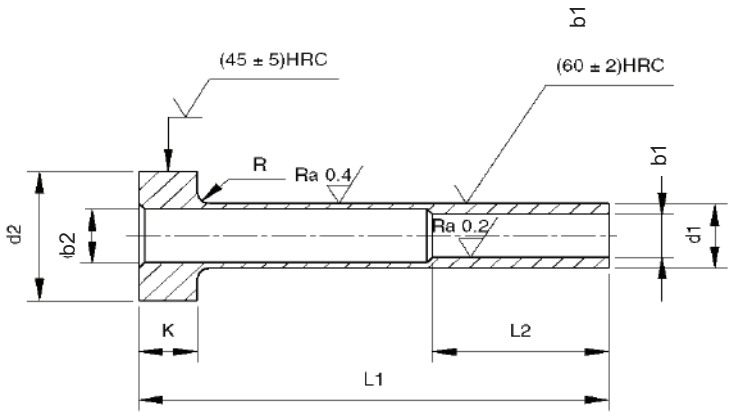
d2	d3	t	k	d1	11
15	M10	12	18	10	100
					200
				10.5	100
					200
18	M12	14	22	12	100
					200
				12.5	100
					200
20	M12	14	22	14	100
					200
				14.5	100
					200
22	M16	18	25	16	100
					200
				16.5	100
					200

Ejector Sleeves

MATERIAL: WAS 1.2344 Hotwork Die Steel

STANDARD: DIN 16756/ISO 8405

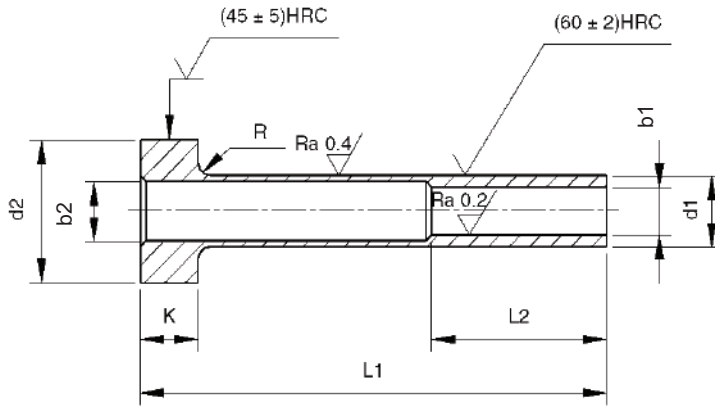
HARDNESS: I.D. & O.D. Nitrided to ≧ 950° HV



d1 g6	b1 H5	d2	K	b2	L2	R	L1 +2										
							60	75	100	125	150	175	200	225	250	275	300
3	1.5	6	3	1.8	25	0.3											
	1.6			2													
4	2.0	8		2.4	35												
	2.2			2.5													
5	2.5	10		3	45												
	2.7																
	3.0			3.5													
	3.2																
6	3.5	12	5	4		0.5											
	3.7																
	4.0			4.5													
8	4.2	14		5													
	5.0			5.5													
	5.2																
10	6.0	16		6.5													
	6.2																
12	8.0	20	7	8.5		0.8											
	8.2																
14	10	22		10.5	50												
16	12			12.5													

Ejector Sleeves

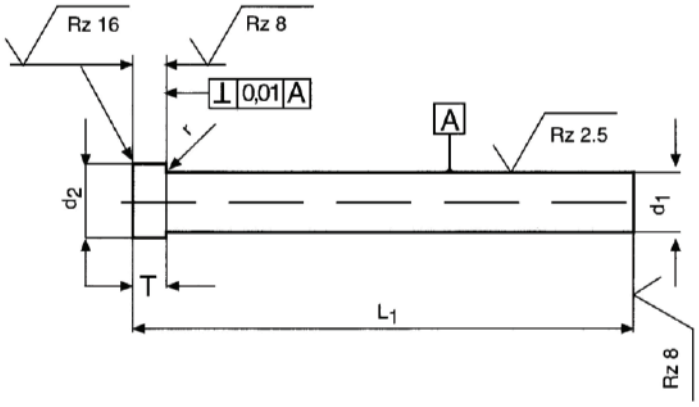
MATERIAL: WS 1.2210 Through Hardened Steel
STANDARD: DIN 16756/ISO 8405
HARDNESS: Throughout hardened at 60±2 HRC



d1 g6	b1 H5	d2	K	b2	L2	R	L1+2										
							60	75	100	125	150	175	200	225	250	275	300
3	1.5	6	3	1.8	25	0.3											
	1.6			2													
4	2.0	8		2.4	35												
	2.2			2.5													
5	2.5	10		3	45												
	2.7																
	3.0			3.5													
	3.2																
6	3.5	12	5	4		0.5											
	3.7																
	4.0			4.5													
8	4.2	14		5													
	5.0			5.5													
	5.2																
10	6.0	16		6.5													
	6.2																
12	8.0	20	7	8.5		0.8											
	8.2																
14	10	22		10.5	50												
16	12			12.5													

Precision Piercing Punches

to ISO 8020 / 8021, Type A



Specification: Hardened, tempered, ground, head hot forged and annealed

Materials: D_2 = Tool Steel
HSS = High Speed Steel

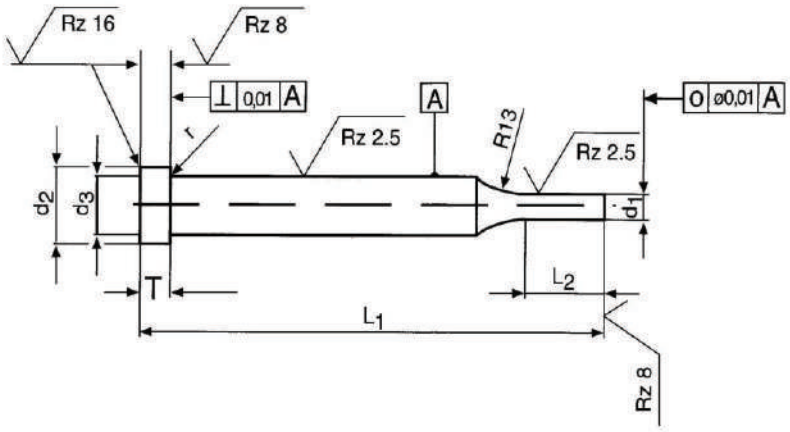
Hardness:

Shaft: Tool Steel D_2	62±2 HRC
HSS	64±2 HRC
Head: Tool Steel D_2	
HSS	50±5 HRC

d1 m5	**d2** 0 -0.15	**T** +0.2 -0.1	**r** +0.1 0	**L1** +0.5 +0.2				
				63	71	80	90	100
3	5	3	0.3					
4	6							
5	8	5						
6	9							
8	11							
10	13							
13	16		0.4					
16	19							
20	24							
25	29							
32	36							

Precision Piercing Punches

with round point to ISO 8020 / 8021, Type B



Point length: L_2: 10mm
L_2: 13mm
L_2: 17mm

Specification: Hardened, tempered, ground, head hot forged and annealed

Materials: D_2 = Tool Steel
HSS = High Speed Steel

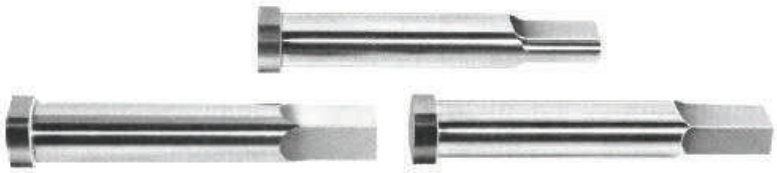
Hardness:

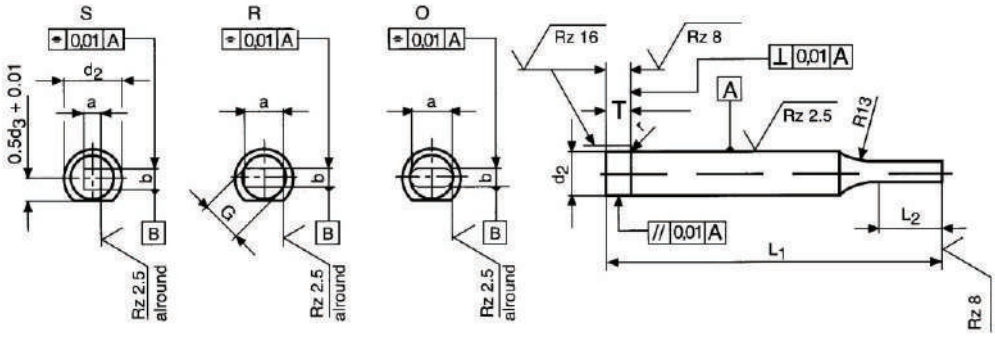
Shaft: Tool Steel D_2	60±2 HRC
HSS	64±2 HRC
Head: Tool Steel D_2	
HSS	50±5 HRC

d1 j6	**in steps of d1**	**d2** 0 -0.15	**d3** m5	**T** +0.2 +0.1	**r** +0.1 0	**L2** +0.5 0	**L1** +0.5 +0.2			
							71	80	90	100
0.8 to 2.9	0.1	5	3	3	0.3	10				
1.0 to 3.9		6	4							
1.2 to 4.9		8	5	5						
1.6 to 5.9		9	6							
2.5 to 7.9		11	8			13				
4.0 to 9.9		13	10			17				
5.0 to 12.9		16	13		0.4					
8.0 to 15.9		19	16							
12.0 to 19.5	0.5	24	20							
16.5 to 24.9		29	25							

Precision Punches

with square, rectangular and oblong point
to ISO 8020 / 8021, Type C





Type CS square point

Type CR rectangular point

Type CO oblong point

Materials: D_2 = Tool Steel
HSS = High Speed Steel

Specification: As punches ISO Type A

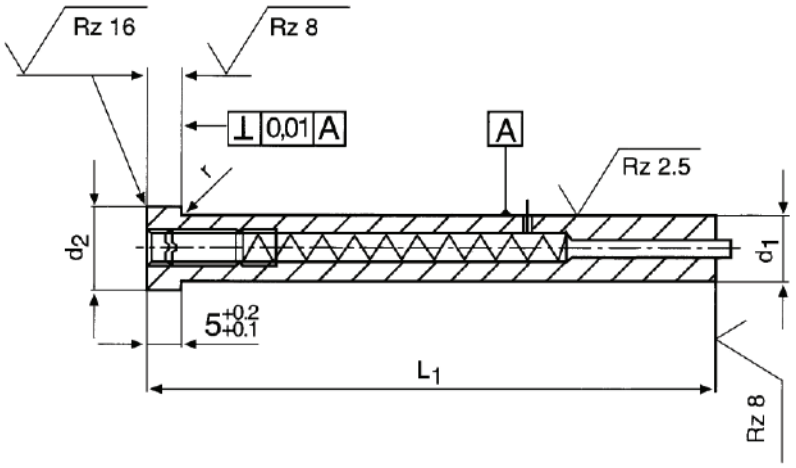
Hardness:

Shaft: Tool Steel D_2	62±2 HRC
HSS	64±2 HRC
Head: Tool Steel D_2,	
HSS	50±5 HRC

a ±0.01	**b** ±0.01	**d2** 0 -0.15	**d3** m5	**T** +0.2 +0.1	**r** +0.1 0	**L2** +0.5 0	**L1** +0.5 +0.2			
							71	80	90	100
to customer's choice, G = max d3		6	4	3	0.3	preferred dimensions =10/13/17; other lengths available				
		8	5	5						
		9	6							
		11	8							
		13	10							
		16	13		0.4					
		19	16							
		24	20							
		29	25							

Precision Punches

with spring loaded ejector pin
to ISO 8020, Type E



Specification: Hardened, tempered, shaft lapped, head hot forged and annealed. Fully assembled with special spiral spring, grub screw and ejector. Spring loaded on the ejector is adjustable by means of the grub screw located in the head

Especially useful for stripping the slugs from the punch, thus avoiding problems normally associated with this operation.

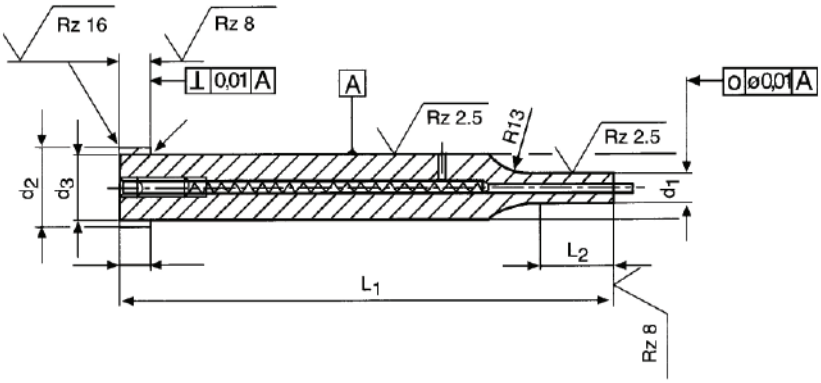
Materials: HSS = High Speed Steel

Hardness: Shaft: 62±2 HRC
Head: 50±5 HRC

d1 m5	**d2** 0 -0.15	**r** +0.1 0	**L1** +0.5 +0.2			
			71	80	90	100
6	9	0.3				
8	11					
10	13					
13	16	0.4				
16	19					
20	24					
25	29					

Precision Punches

with point and spring loaded ejector pin
to ISO 8020, Type F



Part no. 2173…Point length l2 = 10mm
2183…Point length l2 = 13mm
2193…Point length l2 = 17mm

Specification: Hardened, tempered, shaft lapped, head hot forged and annealed. Fully assembled with special spiral spring, grub screw and ejector. Spring loaded on the ejector is adjustable by means of the grub screw located in the head

Especially useful for stripping the slugs from the punch, thus avoiding problems normally associated with this operation.

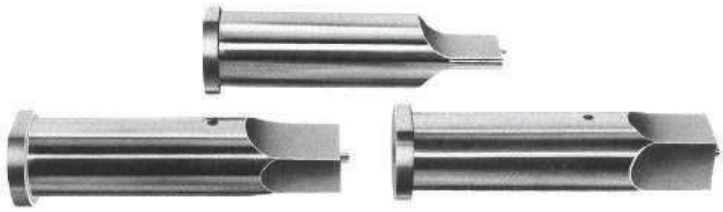
Materials: HSS = High Speed Steel

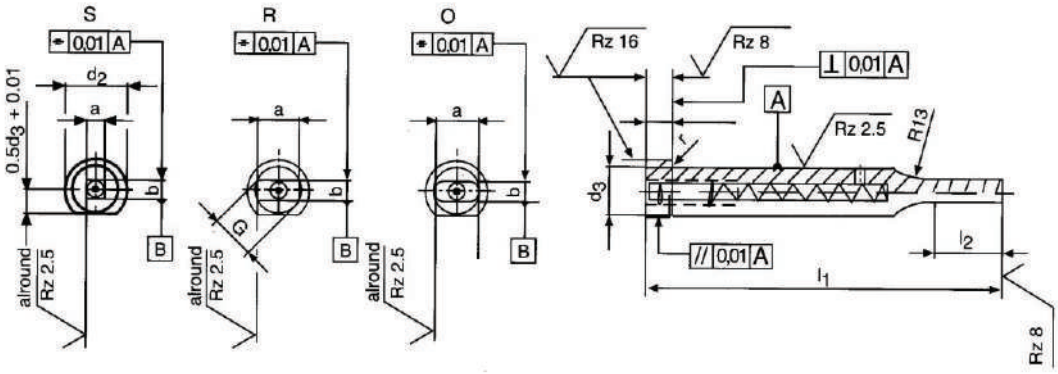
Hardness: Shaft: 62±2 HRC
Head: 50±5 HRC

d1 j6	**in steps of d1**	**d2** 0 -0.15	**d3** m5	**r** +0.1 0	**L2** +0.5 0	**L1** +0.5 +0.2			
						71	80	90	100
1.6 to 5.9	0.1	9	6	0.3	10				
2.5 to 7.9		11	8		13				
4.0 to 9.9		13	10		17				
5.0 to 12.9		16	13	0.4					
8.0 to 15.9		19	16						
12.0 to 19.5	0.5	24	20						
16.5 to 24.5		29	25						

Precision Punches

with square, rectangular and oblong point and spring loaded ejector pin to ISO 8020, Type G





Type GS square point with ejector pin

Type CR rectangular point with ejector pin

Type CO oblong point with ejector pin

Materials: HSS = High Speed Steel

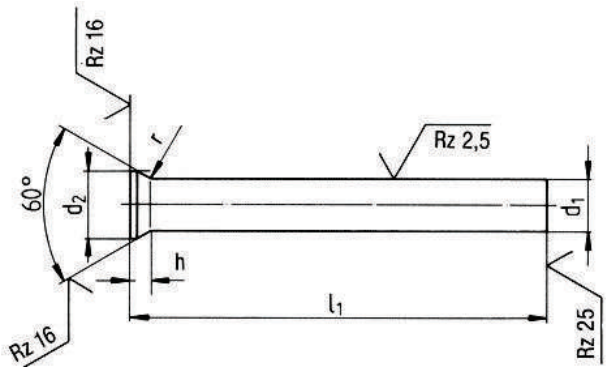
Specification: As punches ISO 8020 Type E

The locating flat is always ‘a’ dimension unless otherwise stated

a ±0.01	**b** ±0.01	**d2** 0 -0.15	**d3** m5	**r** +0.1 0	**L2** +0.5 0	**L1** +0.5 +0.2		
						71	80	90
to customer’s choice, G = max d3		9	6	0.3	preferred dimensions =10/13/17; other lengths available			
		11	8					
		13	10	0.4				
		16	13					
		19	16					
		24	20					
		29	25					

Precision Piercing Punches

to DIN 9861 Part 1, Type D
similar to ISO 6752



Specification: Hardened, tempered, ground, lapped all over. Head hot forged and annealed. Shaft tolerance h6 up to head.
Punches in HWS are heat resistant up to 520℃

Materials: D_2 = Tool Steel
HSS = High Speed Steel
ASP 23 = Powered Steel

Hardness:

Shaft:	Tool Steel D_2	60±2 HRC
	HSS and ASP 23	64±2 HRC
Head:	Tool Steel D_2	50±5 HRC
	HSS and ASP 23	50±5 HRC

How to order: Punch type D
Diameter d1 = 3.8mm and
Length d1 = 80mm in HSS

Punch DIN 9861D 3.8 x 80

d1 h6	**L1** +0.5 0			**d2** ±0.05	**h** +0.2 0	**r**	
0.5	71	80	—	0.9	0.55	0.2	+0.2 0
0.55				1.0	0.59		
0.6				1.1	0.63		
0.65				1.2	0.68		
0.7				1.3	0.72		
0.75					0.68		
0.8				1.4	0.92		
0.85					0.88		
0.9				1.6	1.01		
0.95					0.96		

d1 H6	**L1** +0.5 0			**d2** ±0.05	**h** +0.2 0	**r**	
1.0	71	80	—	1.8	1.19	0.4	+0.3 0
1.1					1.11		
1.2				2.0	1.19		
1.3					1.11		
1.4				2.2	1.19		
1.5					1.11		
1.6				2.5	1.28		
1.7					1.19		
1.8				2.8	1.37		
1.9					1.28		

Precision Piercing Punches

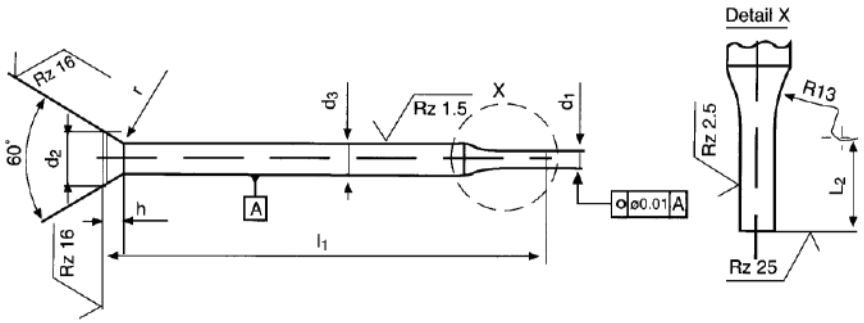
to DIN 9861 Part 1, Type D
similar to ISO 6752

d1 h6	L1 +0.5 0			d2 ±0.05	h +0.2 0	r
2.0	71	80	-	3.0	1.37	0.4 +0.3 0
2.1				3.2	1.45	
2.2					1.37	
2.3				3.5	1.54	
2.4					1.45	
2.5					1.37	
2.6				4.0	1.71	
2.7					1.63	
2.8					1.54	
2.9					1.45	
3.0	71	80	100	4.5	1.80	0.6 +0.4 0
3.1					1.71	
3.2					1.63	
3.3					1.54	
3.4					1.45	
3.5				5.0	1.80	
3.6					1.71	
3.7					1.63	
3.8					1.54	
3.9					1.45	
4.0				5.5	1.80	
4.1					1.71	
4.2					1.63	
4.3					1.54	
4.4					1.45	
4.5				6.0	1.80	
4.6					1.71	
4.7					1.63	
4.8					1.54	
4.9					1.45	
5.0				6.5	1.80	
5.1					1.71	
5.2					1.63	
5.3					1.54	
5.4					1.45	
5.5				7.0	1.80	
5.6					1.71	
5.7					1.63	
5.8					1.54	
5.9					1.45	

d1 H6	L1 +0.5 0			d2 ±0.05	h +0.2 0	r
6.0	71	80	100	8.0	2.23	1.0 +0.5 0
6.1					2.15	
6.2					2.06	
6.3					1.97	
6.4					1.89	
6.5				9.0	3.17	
7.0					2.73	
7.5				10	3.17	
8.0					2.73	
8.5				11	3.17	
9.0					2.73	
9.5				12	3.17	
10.0					2.73	
10.5				13	3.17	
11.0					2.73	
11.5				14	3.17	
12.0					2.73	
12.5				15	3.17	
13.0					2.73	
13.5				16	3.67	1.5 +0.5 0
14.0					3.23	
14.5				17	3.67	
15.0					3.23	
15.5				18	3.67	
16.0					3.23	
16.5				19	3.67	
17.0					3.23	
17.5				20	3.67	
18.0					3.23	
18.5				21	3.67	
19.0					3.23	
19.5				22	3.67	
20.0					3.23	

Precision Piercing Punches

with countersunk head and point
to DIN 9861 Part 2, Type C



Specification: Hardened, tempered, ground, lapped all over. Head hot forged and annealed. Shaft tolerance h6 up to head. (no enlargement)

Hardness: Shaft: Tool Steel D_2 62±2 HRC
HSS and ASP 23 64±2 HRC
Head: Tool Steel D_2,
HSS and ASP 23 50±5 HRC

Materials: D_2 = Tool Steel
HSS = High Speed Steel
ASP 23 = Powered Steel

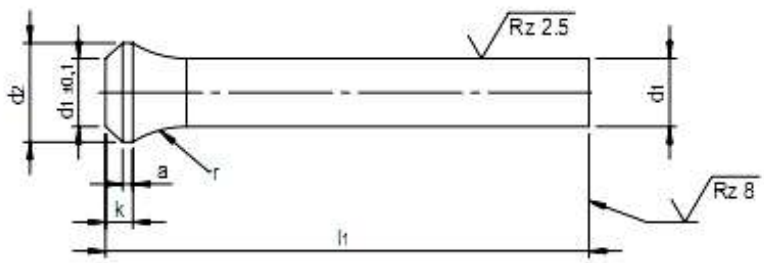
d1 h6		**in steps of**	**L1** +0.5 0		**d2**	**d3** h6	**L2** +0.5	**h** +0.2 0	**r**
more than	to								
0.5	1.4	0.1	71	80	2.2	±0.05	7	1.11	0.4 +0.3 0
0.5	1.9				3.0	±0.1		1.37	
1.6	2.9				4.5			1.80	0.6 +0.4 0
2.5	3.5	0.5			5.5		10		
3.5	4.5				6.5	±0.2			
4.5	5.5				8.0			2.23	1.0 +0.5 0

Bottle Neck Punch

MATERIAL: HSS

HARDNESS: Surface: 64±2 HRC

Core: 50±5 HRC



d1 h6	d2 -0.2	K +0.2	a	r -0.2	L1 +0.5				
					71	80	90	100	120
2.0	3	3.0	1.0	3.5					
2.5	3.5	3.0	1.0	3.5					
3.0	4.5	4.0	1.5	6.5					
3.5	5	4.0	1.5	8.0					
4.0	5.5	4.0	1.5	8.0					
4.5	6.0	4.0	1.5	8.0					
5.0	7.0	4.0	1.5	10.0					
5.5	8.0	4.0	1.5	10.0					
6.0	9.0	4.0	1.5	10.0					
6.5	10.0	4.0	1.5	12.0					
7.0	10.0	4.0	1.5	12.0					
7.5	11.0	4.0	1.5	12.0					
8.0	11.0	4.0	1.5	15.0					
8.5	13.0	4.0	1.5	15.0					
9.0	13.0	4.0	1.5	15.0					
9.5	14.0	4.0	1.5	15.0					
10.0	14.0	4.0	1.5	15.0					
10.5	15.0	4.0	1.5	15.0					
11.0	15.0	4.0	1.5	15.0					

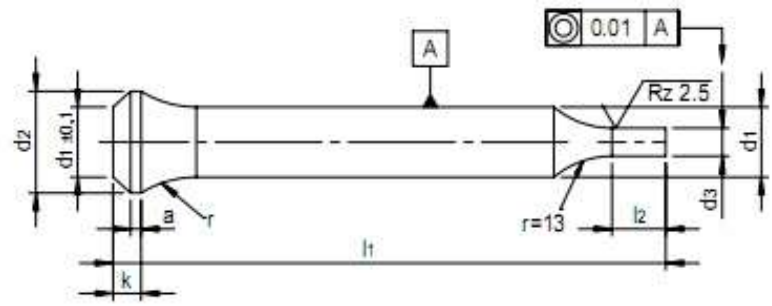
d1 h6	d2 -0.2	K +0.2	a	r -0.2	L1 +0.5				
					71	80	90	100	120
11.5	16.0	4.0	1.5	15.0					
12.0	16.0	4.0	1.5	15.0					
12.5	17.0	4.0	1.5	15.0					
13.0	17.0	4.0	1.5	15.0					
13.5	18.0	4.0	1.5	15.0					
14.0	18.0	4.0	1.5	15.0					
14.5	19.0	4.0	1.5	15.0					
15.0	19.0	4.0	1.5	15.0					
15.5	20.0	4.0	1.5	15.0					
16.0	20.0	4.0	1.5	15.0					
16.5	21.0	4.0	1.5	15.0					
17.0	21.0	4.0	1.5	15.0					
17.5	22.0	4.0	1.5	15.0					
18.0	22.0	4.0	1.5	15.0					
18.5	23.0	4.0	1.5	15.0					
19.0	23.0	4.0	1.5	15.0					
19.5	25.0	4.0	1.5	15.0					
20.0	25.0	4.0	1.5	15.0					

Bottle Neck Stepped Punch

MATERIAL: HSS

HARDNESS: Surface: 64±2 HRC

Core: 50±5 HRC



d1 h6	d3 h6	d2 -0.2	k +0.2	a	r -0.2	l2 +0.2	l1 +0.5				
							71	80	90	100	120
2.0	0.5-1.9	3	3.0	1.0	3.5	7					
2.5	0.5-2.4	3.5	3.0	1.0	3.5	7					
3.0	1.6-2.9	4.5	4.0	1.5	6.5	10					
3.5	1.6-3.4	5	4.0	1.5	8.0	10					
4.0	1.6-3.9	5.5	4.0	1.5	8.0	10					
4.5	2.0-4.4	6.0	4.0	1.5	8.0	10					
5.0	2.5-4.9	7.0	4.0	1.5	10.0	10					
5.5	2.5-5.4	8.0	4.0	1.5	10.0	10					
6.0	3.0-5.9	9.0	4.0	1.5	10.0	10					
6.5	3.0-6.4	10.0	4.0	1.5	12.0	10					
7.0	3.5-6.9	10.0	4.0	1.5	12.0	10					
7.5	3.5-7.4	11.0	4.0	1.5	12.0	10					
8.0	3.5-7.9	11.0	4.0	1.5	15.0	13					
8.5	4.0-8.4	13.0	4.0	1.5	15.0	13					
9.0	4.0-8.9	13.0	4.0	1.5	15.0	13					
9.5	4.5-9.4	14.0	4.0	1.5	15.0	13					
10.0	5.0-9.9	14.0	4.0	1.5	15.0	17					
10.5	5.5-10.4	15.0	4.0	1.5	15.0	17					
11.0	5.5-10.9	15.0	4.0	1.5	15.0	17					

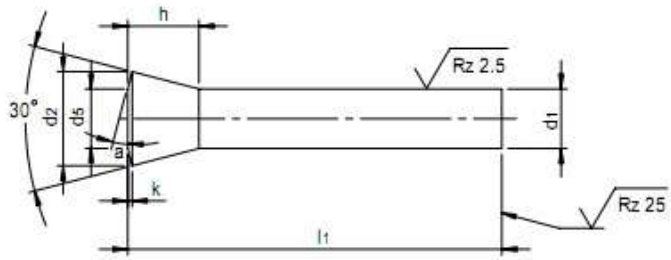
d1 h6	d3 h6	d2 -0.2	k +0.2	a	r -0.2	l2 +0.2	l1 +0.5				
							71	80	90	100	120
11.5	6.0-11.4	16.0	4.0	1.5	15.0	17					
12.0	6.0-11.9	16.0	4.0	1.5	15.0	17					
12.5	7.0-12.4	17.0	4.0	1.5	15.0	17					
13.0	9.0-12.9	17.0	4.0	1.5	15.0	17					
13.5	9.5-13.9	18.0	4.0	1.5	15.0	17					
14.0	9.5-14.4	18.0	4.0	1.5	15.0	17					
14.5	10.0-14.9	19.0	4.0	1.5	15.0	17					
15.0	10.5-15.4	19.0	4.0	1.5	15.0	17					
15.5	12.0-15.9	20.0	4.0	1.5	15.0	17					
16.0	12.5-16.4	20.0	4.0	1.5	15.0	17					
16.5	13.0-16.9	21.0	4.0	1.5	15.0	17					
17.0	13.0-17.4	21.0	4.0	1.5	15.0	17					
17.5	13.0-17.9	22.0	4.0	1.5	15.0	17					
18.0	13.5-17.9	22.0	4.0	1.5	15.0	17					
18.5	13.5-18.4	23.0	4.0	1.5	15.0	17					
19.0	14.0-18.9	23.0	4.0	1.5	15.0	17					
19.5	15.0-19.4	25.0	4.0	1.5	15.0	17					
20.0	16.0-19.9	25.0	4.0	1.5	15.0	17					

30° Headed punch

MATERIAL: HSS

HARDNESS: Surface: 64±2 HRC

Core: 50±5 HRC



d1 h6	**d2** -0.2	**d5**	**h**	**a**	**k**	**l1** +0.5				
						71	80	90	100	120
4.0	6.6	3.8	6.0	1.0	35.0					
5.0	8.2	5.0	7.0	1.0	32.0					
6.0	9.7	6.0	8.0	1.0	28.0					
7.0	11.8	7.0	9.0	1.0	22.6					
8.0	12.8	8.0	10.	1.0	22.5					
9.0	14.4	9.0	11.0	1.0	20.0					
10.0	15.9	10.0	12.0	1.0	19.0					

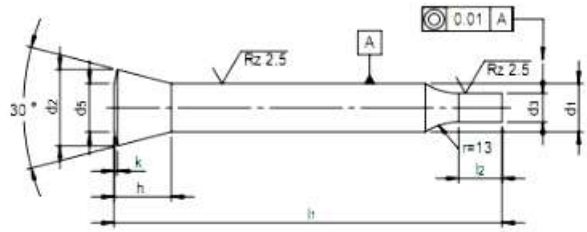
d1 h6	**d2** -0.2	**d5**	**h**	**a**	**k**	**l1** +0.5				
						71	80	90	100	120
11.0	17.4	11.0	13.0	1.5	25					
12.0	18.7	12.0	14.0	1.5	24					
13.0	20.2	13.	15.0	1.5	23					
14.0	21.8	14.0	16.0	1.5	21					
15.0	23.3	15.0	17.0	1.5	20					
16.0	24.6	16.0	18.0	1.5	25					

30° Headed Stepped Punch

MATERIAL: HSS

HARDNESS: Surface: 64±2 HRC

Core: 50±5 HRC



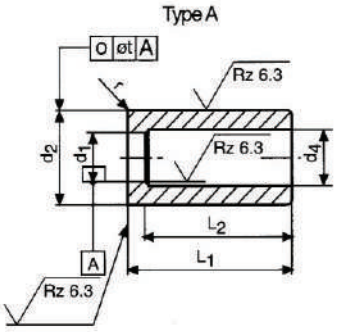
d1 h6	d3 h6	d2 -0.2	d5	h	k	l1 +0.5				
						71	80	90	100	120
4.0	1.6-3.9	10	3.8	6.0	35.0					
5.0	2.5-4.9	10	5.0	7.0	32.0					
6.0	3.0-5.9	10	6.0	8.0	28.0					
7.0	3.0-6.9	10	7.0	9.0	22.6					
8.0	4.0-7.9	13	8.0	10.	22.5					
9.0	4.5-8.9	13	9.0	11.0	20.0					
10.0	5.0-9.9	17	10.0	12.0	19.0					

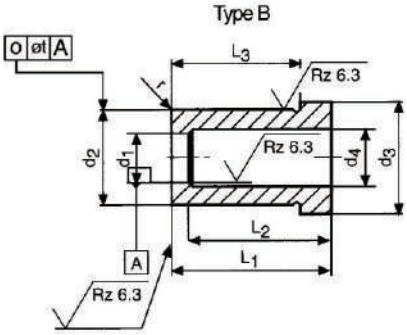
d1 h6	d3 h6	d2 -0.2	d5	h	k	l1 +0.5				
						71	80	90	100	120
11.0	5.0-10.9	17	11.0	13.0	1.5					
12.0	6.0-11.9	17	12.0	14.0	1.5					
13.0	9.0-12.9	17	13.	15.0	1.5					
14.0	9.5-13.9	17	14.0	16.0	1.5					
15.0	10.0-14.9	17	15.0	17.0	1.5					
16.0	12.0-15.9	17	16.0	18.0	2.0					

Precision Die Bushes

to DIN 9845

Type A: headless, Type B: with head





Specification: Type A: headless, hardened and tempered: ground bore d1 to tolerance H8. Outside diameter d2 to tolerance n6.
Type B: headed, hardened and tempered: ground bore d1 to tolerance H8. Outside diameter d2 to tolerance k6.

Both types are supplied with a counter borer or taper relief 30'

Materials: D2 = Tool Steel

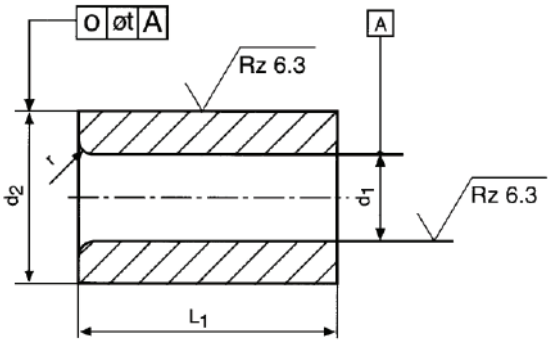
Hardness: 62±2 HRC

d1 H8	**in steps of**	**d2** Type A: n6 Type B: k6	**d3**	**d4** ±0.1	**short**			**long**			**r**	**t**
					L1 +0.5 0	**L2**	**L3**	**L1** +0.5 0	**L2**	**L3**		
1.0	0.1	5	7	d1 + 0.3	20	18	16	—	—	—	0.3	0.01
1.1 – 2.0		6	8	d1 + 0.3				28	25	24		
2.1 – 3.0		7	9	d1 + 0.5		17					0.4	
3.1 – 4.0		8	10	d1 + 0.5								
4.1 – 5.0		10	12	d1 + 0.7		16			24		0.6	0.02
5.1 – 6.0		12	14	d1 + 0.7								
6.1– 8.0		15	17	d1 + 0.7							0.8	
8.1 – 10.0		18	20	d1 + 1								
10.1 – 12.0		22	24	d1 + 1		15			23			
12.1 – 15.0		26	28	d1 + 1								
15.1 – 18.0	0.5	30	32	d1 + 1	—	—	—				1	

Precision Guide Bushes

to DIN 9845

Type C



Materials: Case hardened steel

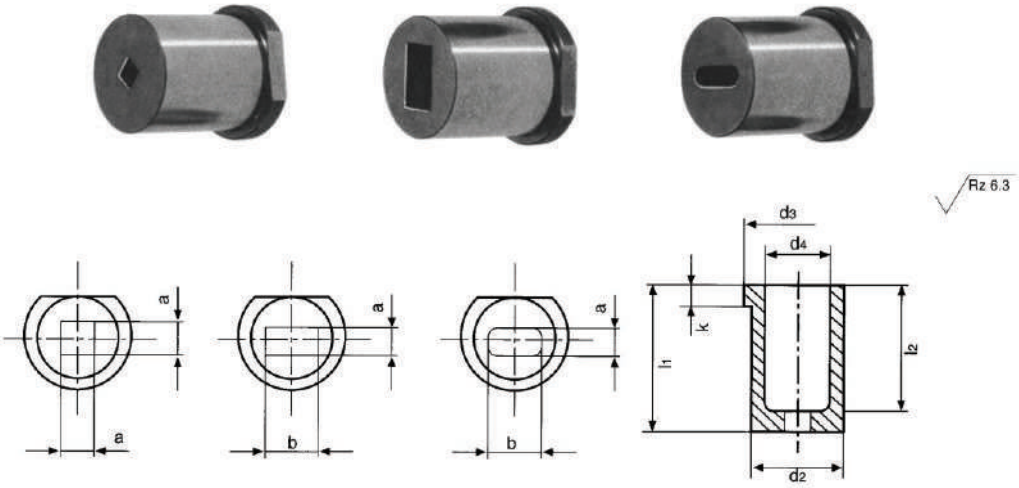
Hardness: 740±40 HV 10

Specification: Hardened and tempered, bore ground to tolerance H7. Outside diameter ground to tolerance n6. The bushes are supplied with lead-in radius

d1 H7	in steps of	d2 n6	L1	r	t
1.0	0.1	5	9	1	0.01
1.1 – 2.0		6	12		
2.1 – 3.0		7			
3.1 – 4.0		8			
4.1 – 5.0		10	16		
5.1 – 6.0		12		1.5	0.02
6.1 – 8.0		15	20		
8.1 – 10.0		18		2	
10.1 – 12.0		22	28		
12.1 – 15.0		26			
15.1 – 18.0	0.5	30	36		

Headed Shaped Die Bushes

square, rectangular, oblong with locators
to ISO 8977



Type S: square shape
Type R: rectangular shape
Type O: oblong shape

Materials: HSS = High Speed Steel
Hardness: 62±2 HRC

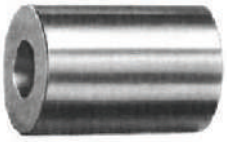
Specification: Hardened, tempered, outside diameter ground and lapped. Shaped hole wire eroded.
The locating flat is always positioned on the longest side unless otherwise stated.

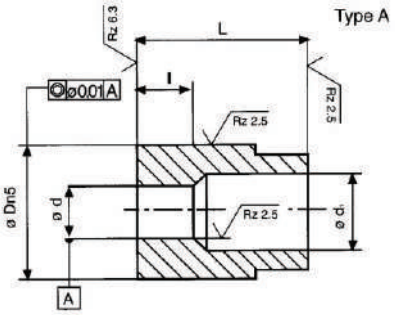
a H8	**b** H8	**in steps of**	**d2** m5	**d3**	**d4**	**k** +0.25 0	**L1** +0.5 0	**L2**
1.6 – 5.4	2.0 – 5.5		10	13	6.5			29
2.0 – 7.4	2.5 – 7.5		13	16	8.5			28
2.2 – 9.9	2.5 – 10.0		16	19	11.0			28
2.5 – 12.9	3.2 – 13.0	0.1	20	24	14.0	5	32	27
3.2 – 15.9	4.0 – 16.0		25	29	17.0			27
4.0 – 20.9	5.0 – 21.0		32	36	22.0			26
5.0 – 26.9	6.3 – 27.0		40	44	28.0			24

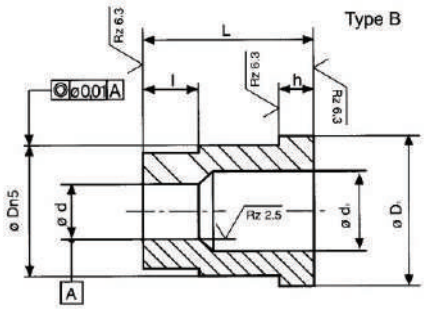
Precision Die Bushes

to ISO 8977

Type A: headless, Type B: with head







Specification:

Type A: headless hardened and tempered: ground bore d to tolerance H8. Outside diameter D ground to tolerance n5.
Type B: headed, hardened and tempered: ground bore d to tolerance H8. Outside diameter D to tolerance m5.

Both types are supplied with counter bore of taper relief.

Material:
D2 = Tool Steel
HSS = High Chrome Steel

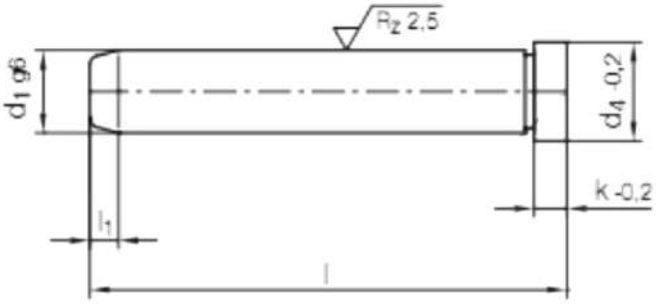
Hardness:
D2 = 62±2 HRC
HSS = 4±2 HRC

How to order:
For die bushes, type B in HSS with bore diameter d = 5 mm,
Outside diameter D= 10 mm and
Overall length L = 225mm:
Die Bush ISO 8977 B

a H8	**in steps of**	**D** Type A: n5 Type B: m5	**D1** 0 0.25	**d1** max	**L1** +0.5 0				**l**	**h** +0.25
1.0 – 2.4	0.1	5	8	2.8	16	20	25	—	2	5
1.6 – 3.0		6	9	3.5					3	
2.0 – 3.5		8	11	4.0				32	4	
3.0 – 5.0		10	13	5.8						
4.0 – 7.2		13	16	8.0	—				5	
6.0 – 8.8		16	19	9.5						
7.5 – 11.3		20	24	12.0					8	
11.0 – 16.6		25	29	17.3						
15.0 – 20.0	0.5	32	36	20.7						
18.0 – 27.0		40	44	27.7						
26.0 – 36.0		50	54	37.7						

Angle Pin

MATERIAL: 1.0401/720 HV

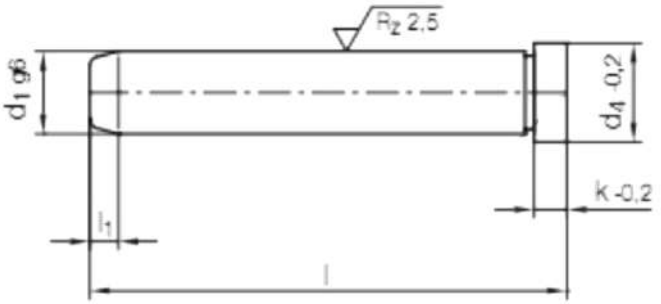


l1	d4	k	d1	l
4	10	3	8	40
				50
				60
				80
				100
	12		9	40
				60
				80
				100
				120
			10	40
				60
				80
				100
				120
7	16	6	12	40
				60
				80
				100
				120
				140
				160
	18	8	14	60
				80
				100
				120
				140
				160
				180

l1	d4	k	d1	l
7	18	8	15	60
				80
				100
				120
				140
				160
				180
	20		16	40
				60
				80
				100
				120
				140
				160
				180
				200
	22		18	60
				80
				100
				120
				140
				160
				180
				200
				240

Angle Pin

MATERIAL: 1.0401/720 HV

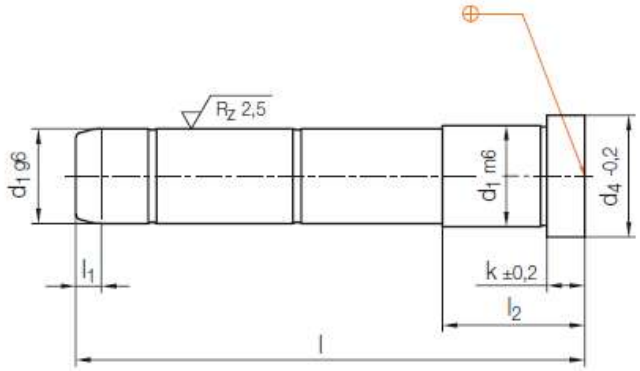


l1	d4	k	d1	l
7	24	8	20	60
				80
				100
				120
				140
				160
				180
				200
				240
	26	15	22	80
				100
				120
				140
				160
				180
				200
				220
				240
				300
	28		24	80
				100
				120
				140
				160
				180
				200
				220
				240
				300

l1	d4	k	d1	l
7	36	15	30	100
				120
				160
				200
				240
				300
				360
			32	100
				120
				160
				200
				240
				300
				360
10	48		40	160
				200
				240
				300
				360
	58		50	160
				200
				240
				300
				360

Guide Pillar

MATERIAL: 1.0401/720 HV 30

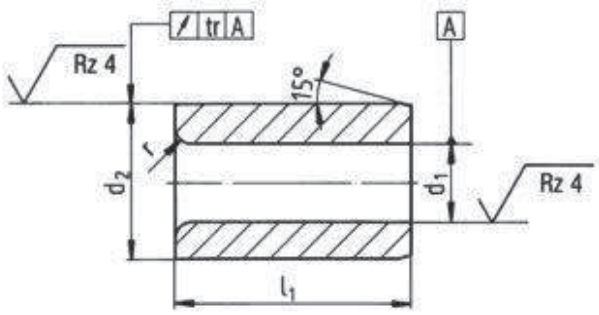


l1	k	d4	l2	d1	L
4	3	12	17	10	40
					60
			22		80
			27		100
7	6	16	17	12	60
			22		80
			27		100
			36		120
	8	18	17	14	60
			22		80
			27		100
			36		120
			46		140
					160
		20	22	16	60
			27		80
					100
			36		120
			46		140
					160
		22	27	18	80
					100
			36		120
			46		140
					160
			56		180
					200
		24	27	20	80
					100
			36		120
			46		140
					160
			56		180
					200

l1	k	d4	l2	d1	L
7	15	26	36	22	100
			46		120
					140
			56		160
					180
			76		200
					220
		28	36	24	100
			46		120
					140
			56		160
					180
			76		200
					240
		36	56	30	160
					200
			76		240
		36	56	32	160
					200
			76		240
10		48	56	40	200
			76		240
			96		300
		58	56	50	200
			76		240
			96		300
12	20	68	76	60	240
			96		300
			116		360

Precision Headless Jig Bushes

to DIN 179, similar to ISO 4247



Materials: Case hardened steel

Hardness: 740+80 HV 10

Specification: Hardened and tempered. Bore ground to tolerance F7. Outside diameter ground to tolerance n6.

Type A: Bore radius on one side only.

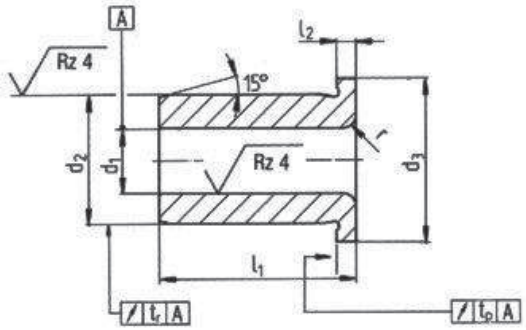
Type B: Bore radius on both sides.

The bushes are supplied with lead-in edge.

d1 F7		L1 short	L1 medium	L1 long	d2 n6	r	tr
0.4 – 0.8	Bore d1 stepped <15 in increments of 0.1mm and 0.25mm >15 preferable in increments of 0.5mm	6	—	—	3	1	0.01
0.9 – 1.0			9	—	3		
1.1 – 1.8					4		
1.9 – 2.6					5		
2.7 – 3.3		8	12	16	6	1	
3.4 – 4.0					7		
4.1 – 5.0					8		
5.1 – 6.0		10	16	20	10	1.5	0.02
6.1- 8.0					12		
8.1 – 10.0		12	20	25	15	2	
10.1 – 12.0					18		
12.1 – 15.0		16	28	36	22		
15.1 – 18.0					26		
18.1 – 22.0		20	36	45	30	3	
22.1 – 26.0					35		
26.1 – 30.0		25	45	56	42		
30.1 – 35.0					48		0.04
35.1 – 42.0		30	56	67	55	3.5	
42.1 – 48.0					62		
48.1 – 55.0					70		
55.1 – 63.0		35	67	78	78	4	

Precision Headed Jig Bushes

to DIN 172, similar to ISO 4247



Materials: Case hardened steel

Hardness: 740±80 HV 10

Specification: Hardened and tempered. Bore ground to tolerance F7. Outside diameter d2 ground to tolerance n6.

Type A: Bore radius on one side only.

Type B: Bore radius on both sides.

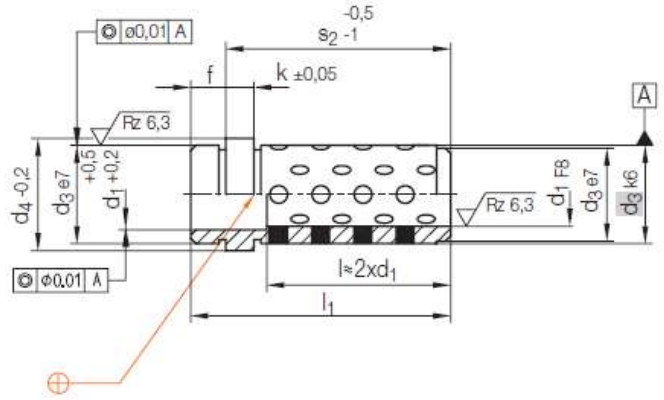
The bushes are supplied with lead-in edge.

d1 F7		L1 short	L1 medium	L1 long	d2 n6	d3	L2	r	tr	tp
0.4 – 0.8	Bore d1 stepped <15 in increments of 0.1mm and 0.25mm >15 preferable in increments of 0.5mm	6	—	—	3	6	2	1	0.01	0.03
0.9 – 1.0			9	—	3	6				
1.1 – 1.8					4	7				
1.9 – 2.6					5	8				
2.7 – 3.3		8	12	16	6	9	2.5	1		
3.4 – 4.0					7	10				
4.1 – 5.0					8	11				
5.1 – 6.0		10	16	20	10	13	3	1.5	0.02	
6.1- 8.0					12	15				
8.1 – 10.0		12	20	25	15	18		2		
10.1 – 12.0					18	22	4	2		
12.1 – 15.0		16	28	36	22	26				
15.1 – 18.0					26	30				
18.1 – 22.0		20	36	45	30	34	5	3		
22.1 – 26.0					35	39				0.05
26.1 – 30.0		25	45	56	42	46				
30.1 – 35.0					48	52		3	0.04	
35.1 – 42.0		30	56	67	55	59		3.5		
42.1 – 48.0					62	66	6			
48.1 – 55.0					70	74				
55.1 – 63.0		35	67	78	78	82		4		

Self-lubricating Guide Bush

STANDARD: 10W

MATERIAL: 2.0975



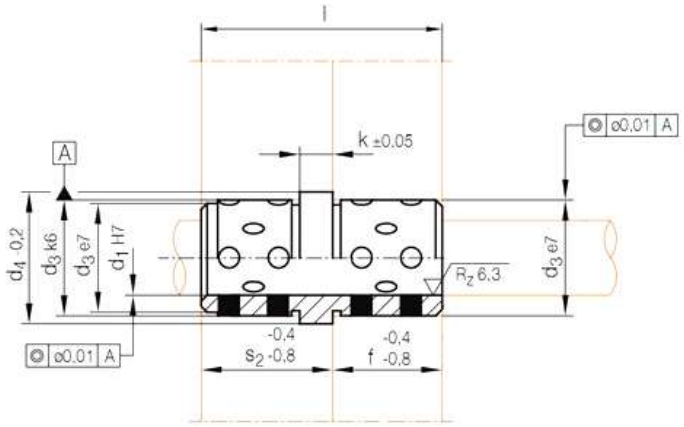
l1	f	k	d3	d4	s2	d1
17	5	3	14	16	12	9, 10
22					17	
27					22	
32					27	
41					36	
51					46	
61					56	
71					66	
23	6	6	20	25	17	14, 15
28					22	
33					27	
42					36	
52					46	
62					56	
72					66	
82					76	
92					86	
25	8	6	26	31	17	18, 20
30					22	
35					27	
44					36	
54					46	
64					56	
74					66	
84					76	
94					86	
104					96	
124					116	
30	8	6	30	35	22	22, 24
35					27	
44					36	
54					46	
64					56	
74					66	

l1	f	k	d3	d4	s2	d1
84	8	6	30	35	76	22, 24
94					86	
104					96	
124					116	
144					136	
164					156	
35	8	6	42	47	27	30, 32
44					36	
54					46	
64					56	
74					66	
84					76	
94					86	
104					96	
124					116	
144					136	
56	10	10	54	60	46	40, 42
66					56	
76					66	
86					76	
96					86	
106					96	
126					116	
146					136	
166					156	
206					196	

Self-lubricating Guide Bush

STANDARD: 13W

MATERIAL: 2.0975

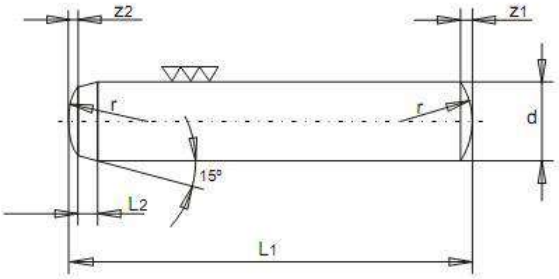


l	f	k	d3	d4	s2	d1
26	9	6	20	25	17	14, 15
39	17		26	31	22	18, 20
49	22		30	35	27	22, 24
63	27		42	47	36	30, 32

Dowel Pin DIN 6325/ISO8734

MATERIAL: Special chrome steel

HARDNESS: 60-62 HRC

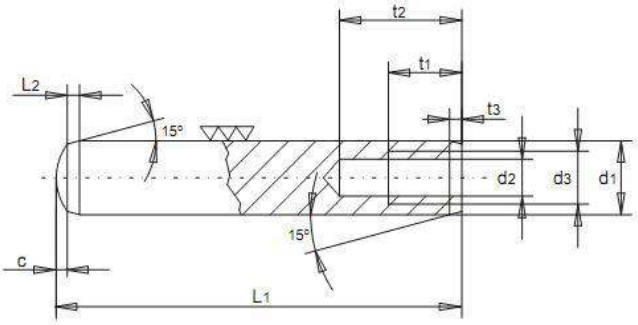


d (m6)	2	2.5	3	4	5	6	7	8	9	10	12	14	16	18	20
L2	0.6	0.7	0.8	1	1.2	1.5	1.6	1.8	1.8	2	2.5	2.5	3	3.5	4
r (apr.)	2	2.5	3	4	5	6	8	8	10	10	12	16	16	18	20
z1 (apr.)	0.3	0.4	0.45	0.6	0.75	0.9	0.8	1.2	0.8	1.5	1.8	2	2.5	2.4	3
z2 (apr.)	0.18	0.25	0.3	0.4	0.5	0.6	0.62	0.8	0.75	1	1.3	1.3	1.7	1.7	2
L1 (j14)															
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															
130															
140															
150															

Dowel Pin DIN 7979/ISO8735

MATERIAL: Special chrome steel

HARDNESS: 60-62 HRC

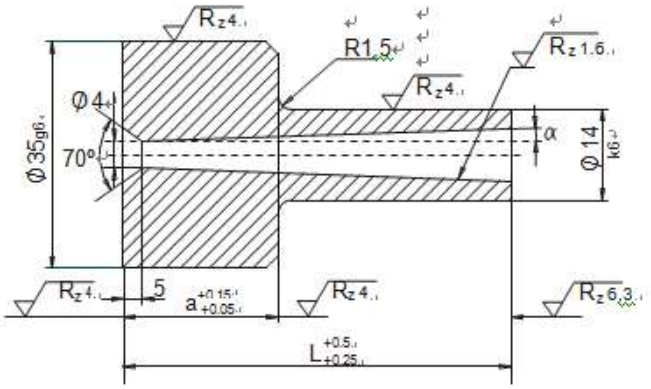


d1 (m6)	5	6	8	10	12	14	16	18	20
2	M3	M4	M5	M6	M6	M8	M8	M10	M10
d3	3.3	4.3	5.3	6.3	6.3	8.3	8.3	10.3	10.3
t1	4	6	8	10	12	12	16	20	20
t2	6	10	13	16	18	18	23	27	27
t3	1	1	1.2	1.2	1.2	1.2	1.6	1.6	1.6
C. máx.	0.7	0.9	1.2	1.5	1.8	2	2.5	3	3
r	6	6	10	10	14	16	16	20	20
L2	1	1	1	1.2	1.5	1.6	2	2	2

d1 (m6)	5	6	8	10	12	14	16	18	20
L1 (j14)									
16									
18									
20									
22									
24									
28									
30									
32									
36									
40									
45									
50									
55									
60									
70									
80									
90									
100									
120									
140									

Sprue Bush B1/B1T

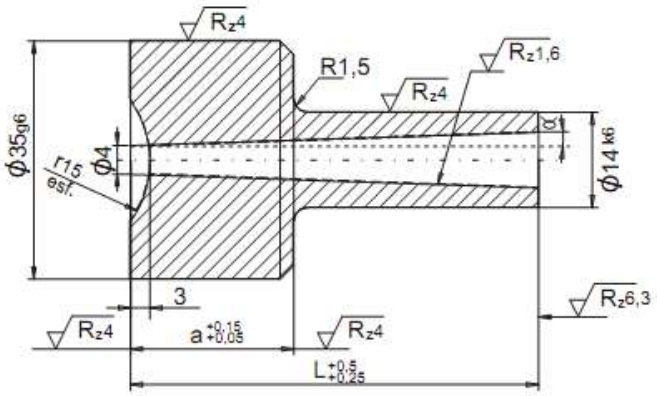
MATERIAL: Case hardened steel
HARDNESS: B1 = Not hardened 21-23 HRC
B1T = Hardened 60-62 HRC



a	L									d1
	α=2°						α=1°			
	27	36	46	51	60	70	70	100	128	
12	*	*	*			*	*	*	*	**4**
24				*	*	*		*	*	

Sprue Bush B3/B3T

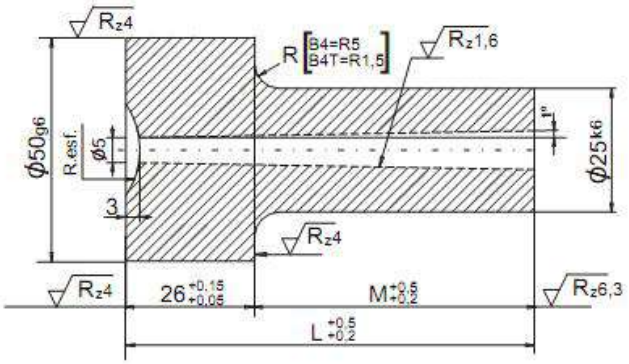
MATERIAL: Case hardened steel
HARDNESS: B3 = Not hardened 21-23 HRC
B3T = Hardened 60-62 HRC



a	L							
	α=2°						α=1°	
	27	36	46	51	60	70	70	100
12	*	*	*				*	*
24				*	*	*		*

Sprue Bush B4/B4T

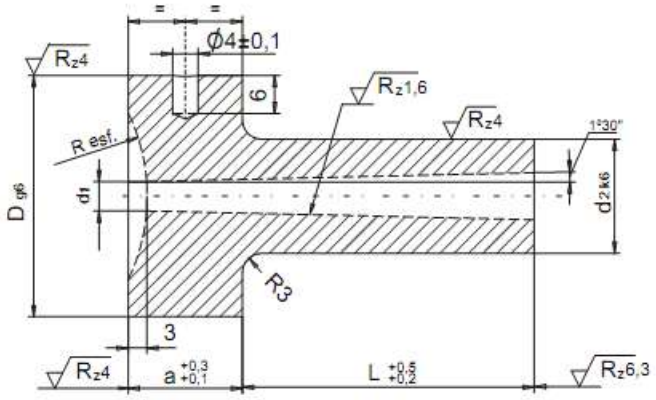
MATERIAL: Case hardened steel
HARDNESS: B4 = Not hardened 21-23 HRC
B4T = Hardened 60-62 HRC



M	26.5	36.5	46.5	56.5	66.5	76.5	86.5	96.5	106.5	116.5	126.5	136.5	156.5
L	52.5	62.5	72.5	82.5	92.5	102.5	112.5	122.5	132.5	142.5	152.5	162.5	182.5
R esf.	15, 19, 40.												

Sprue Bush B5

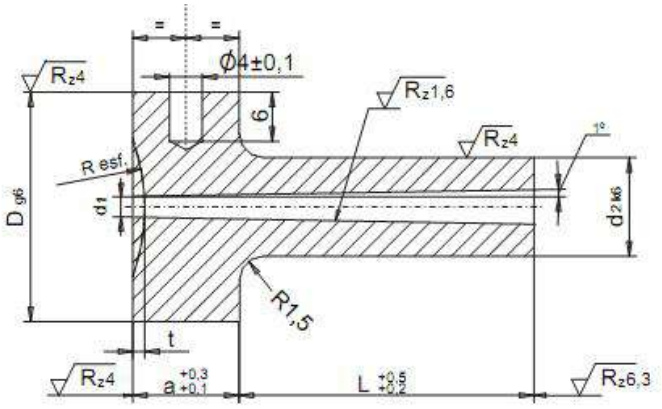
MATERIAL: Case hardened steel
HARDNESS: 58-60 HRC



D	a	d2	R esf.	d1	L				
					27	36	46	56	76
38	18	18	15,5-40	3.5	*	*	*	*	
38	18	18	15,5-40	4.5	*	*	*	*	*
48	23	24	15,5-40	4.5			*	*	*
48	23	24	15,5-40	6.5				*	*

Sprue Bush B7

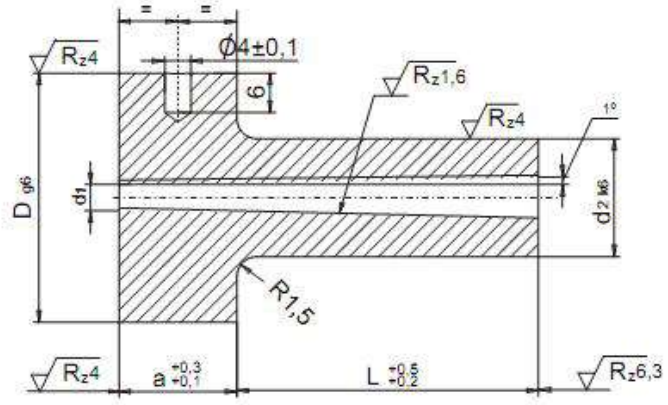
MATERIAL: Case hardened steel
HARDNESS: 58-60 HRC



D	a	d2	R esf.	t	d1	L							
						22	27	36	46	56	76	96	116
28	13	12	15,5-40	1.5	2.5	*	*	*	*				
28	13	12	15,5-40	1.5	3.5	*	*	*	*	*			
38	18	18	15,5-40	3	3		*	*	*	*	*	*	*
38	18	18	15,5-40	3	4		*	*	*	*	*	*	*

Sprue Bush B8

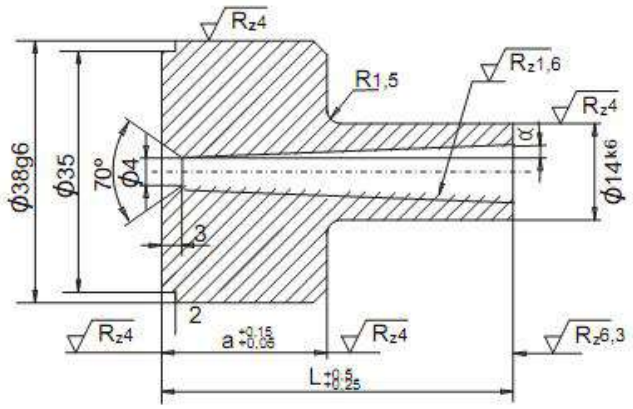
MATERIAL: Case hardened steel
HARDNESS: 58-60 HRC



D	a	d2	d1	L							
				22	27	36	46	56	76	96	116
28	13	12	2.5	*	*	*	*				
28	13	12	3.5	*	*	*	*	*			
38	18	18	3		*	*	*	*	*	*	*
38	18	18	4		*	*	*	*	*	*	*

Sprue Bush B11/B11T

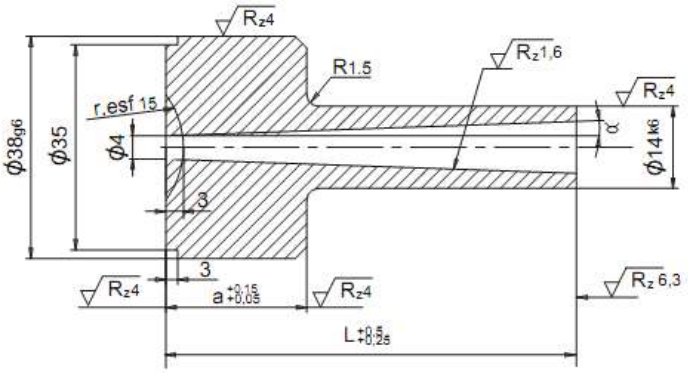
MATERIAL: Case hardened steel
HARDNESS: B11 = Not hardened 21-23 HRC
B11T = Hardened 60-62 HRC



a	L							
	α=2°						α=1°	
	29	38	48	51	60	70	70	100
12	*	*	*				*	*
24				*	*	*		*

Sprue Bush B31/B31T

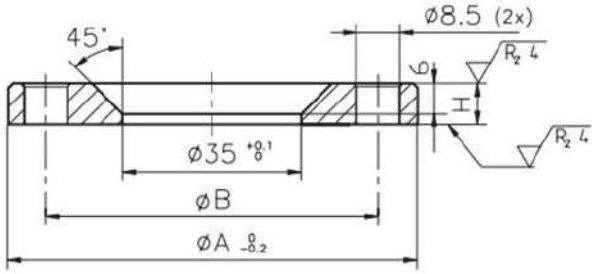
MATERIAL: Case hardened steel
HARDNESS: B31 = Not hardened 21-23 HRC
B31T = Hardened 60-62 HRC



a	L							
	α=2°						α=1°	
	29	38	48	51	60	70	70	100
12	*	*	*				*	*
24				*	*	*		*

Locating Ring

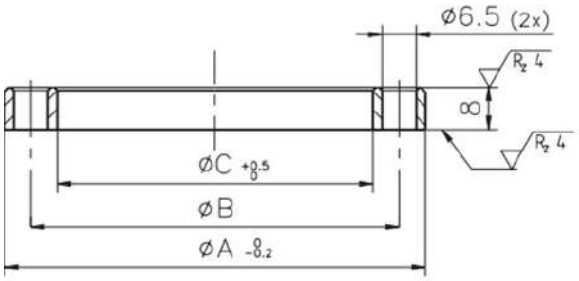
MATERIAL: Structural steel



A	70	75	80	90	100	110	120	125	150	160	175	200
B	59	61	65	70	75	80	84	86	118	118	130	142
H	8 or 12											

Locating Ring

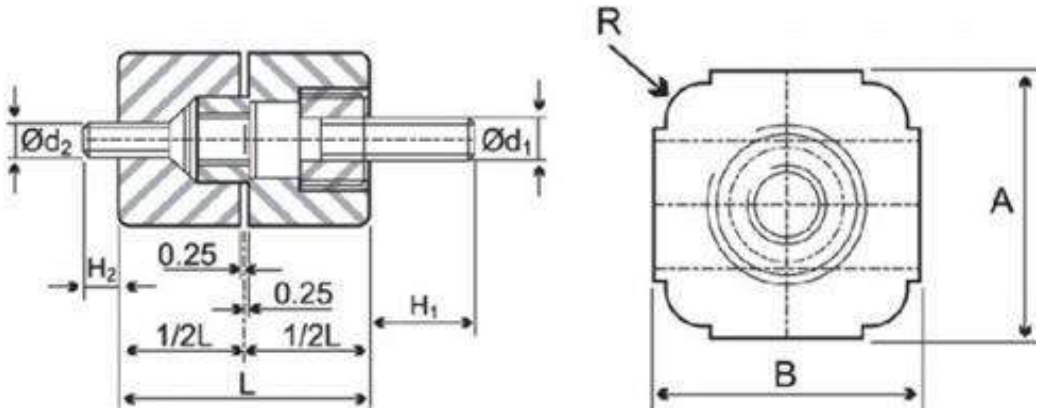
MATERIAL: Structural steel



A	80	90	100	110	120	125	130
B	70	77.5	85	95	105	110	115
C	60	65	70	80	90	95	100

Square Interlocks

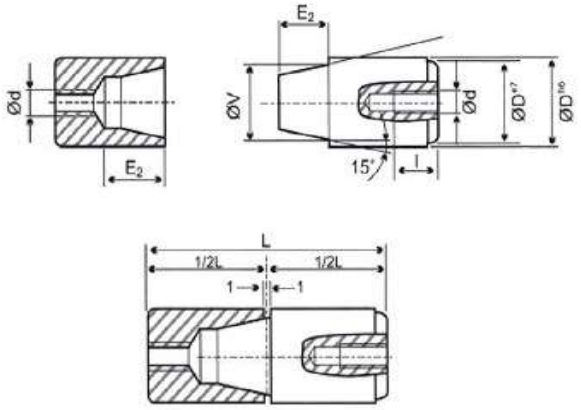
MATERIAL: 1.2343
HARDNESS: 50-55 HRC



A	B	L	d1	d2	H1	H2	R
20	20	28	M5	M4	12	4	4
25	25	32	M6	M5	13	8	5
32	32	36	M8	M6	15	10	6
40	40	45	M10	M7	17	12	6

Round Interlock

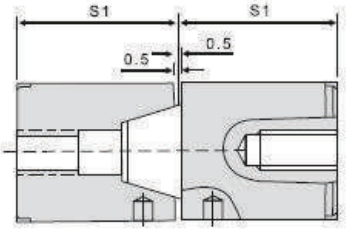
MATERIAL: Tool steel
HARDNESS: 58 +/-2 HRC

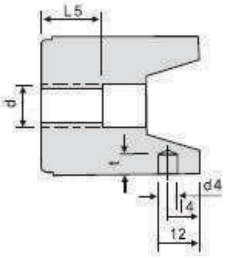


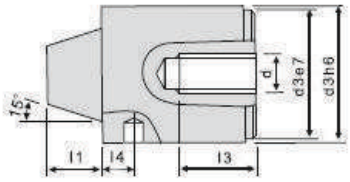
D	L	V	E1	E2	l	d
12	34	8	5	8	10	M4
14	34	10	7	8	11	M5
16	34	10	7	8	11	M5
20	54	15	10	13	15	M8
25	54	20	11	13	15	M8
26	54	20	11	13	15	M8
30	72	25	14	20	18	M10
32	72	25	14	20	18	M10
42	92	35	18	25	18	M10

Round Corner Lock

MATERIAL: 1.2343
HARDNESS: 50-55 HRC



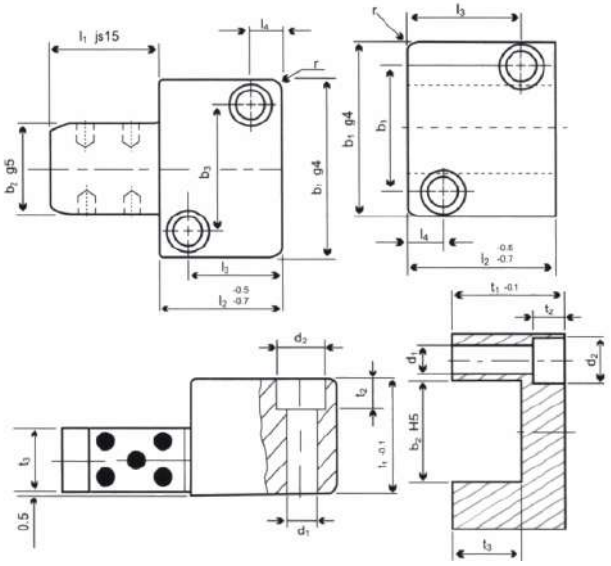




b3	d4	T	l2	d	S1	l1	l3	l4	l5
30	4	5	11.5	M10	36	10.5	20	4.5	16.5
42	5	7	15.5	M10	46	14.5	20	5.5	18.5
54	6	8	18.5	M12	56	17.5	25	7.5	20.5
80	8	11	28.5	M16	76	27.5	30	7.5	25.5

Oilless Side Locks

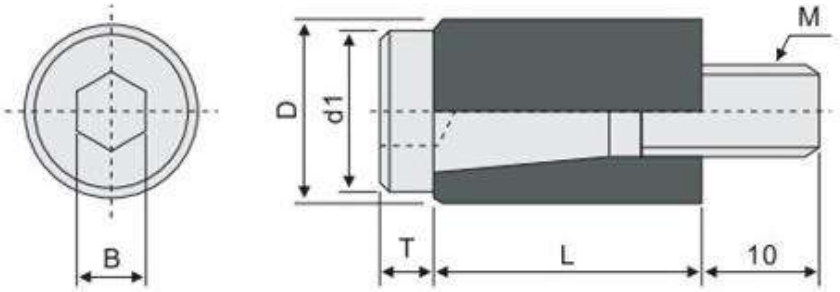
MATERIAL: 1.7131
HARDNESS: 58 +/-2 HRC



b1	b2	l1	l2	t1	t3	d1	d2	t2	b3	l3	l4	r
40	16	20 40	22	20	11	6.6	11	6.8	26	15	7	6
45	20	25 50	27	22	13	6.6	11	6.8	31	19	7	6
50	25	32 63	36	25	14	6.6	11	6.8	35	27	9	8
63	32	40 80	46	32	19	9	15	9	45	35	11	8
85	40	50 100	56	36	22	11	18	11	60	10	15	10
100	50	56 112	66	40	24	14	20	13	74	48	18	10

Parting Locks

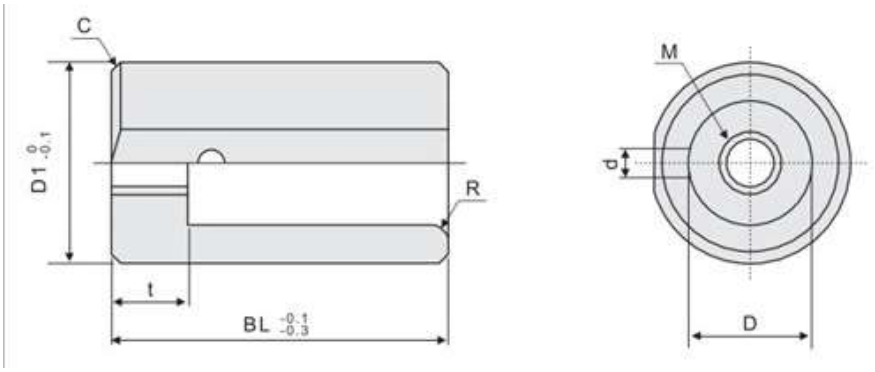
MATERIAL: SCM 435 (1.7220)



	D	d1	M	B	T	L
PL-10	10	8.5	5	4	3	18
PL-12	12	11.5	6	5	4.5	20
PL-13	13	11.5	6	5	4.5	20
PL-16	16	14	8	6	4.5	25
PL-20	20	16	10	8	5.5	30

Parting Lock Bushing

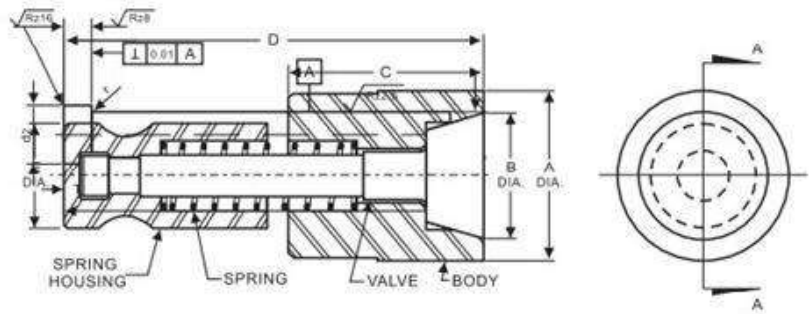
MATERIAL: S45C



D	D1	BL	t	R	d	C	M
10	16	26	6	2	2.3	0.8	6
13	20	30	8	2.5	2.8	1.0	8
16	25	37	10	3	3	1.0	10
20	30	42	10	3	3	1.0	10

Air Poppet Valves

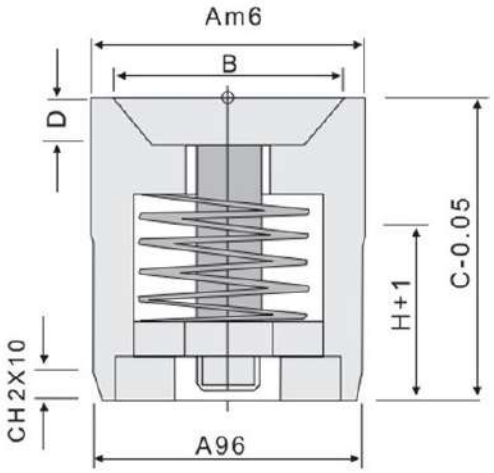
MATERIAL: Stainless steel



A	B	C	D	E
8	6.6	11	24	6
12	9.7	18	34	8
18	14.8	22	45.5	12

Air Valve

MATERIAL: INOX 1.4034
HARDNESS: 48-52 HRC



A	B	C	D	E	H
5	3	12	1.5	4	7
6	5.2	12	1.5	4	7
8	6.5	12	1.5	4	7
10	8	12	2	8	7
12	10	12	2.5	10	7
16	13	20	3	12	12
20	17	20	3.5	16	12