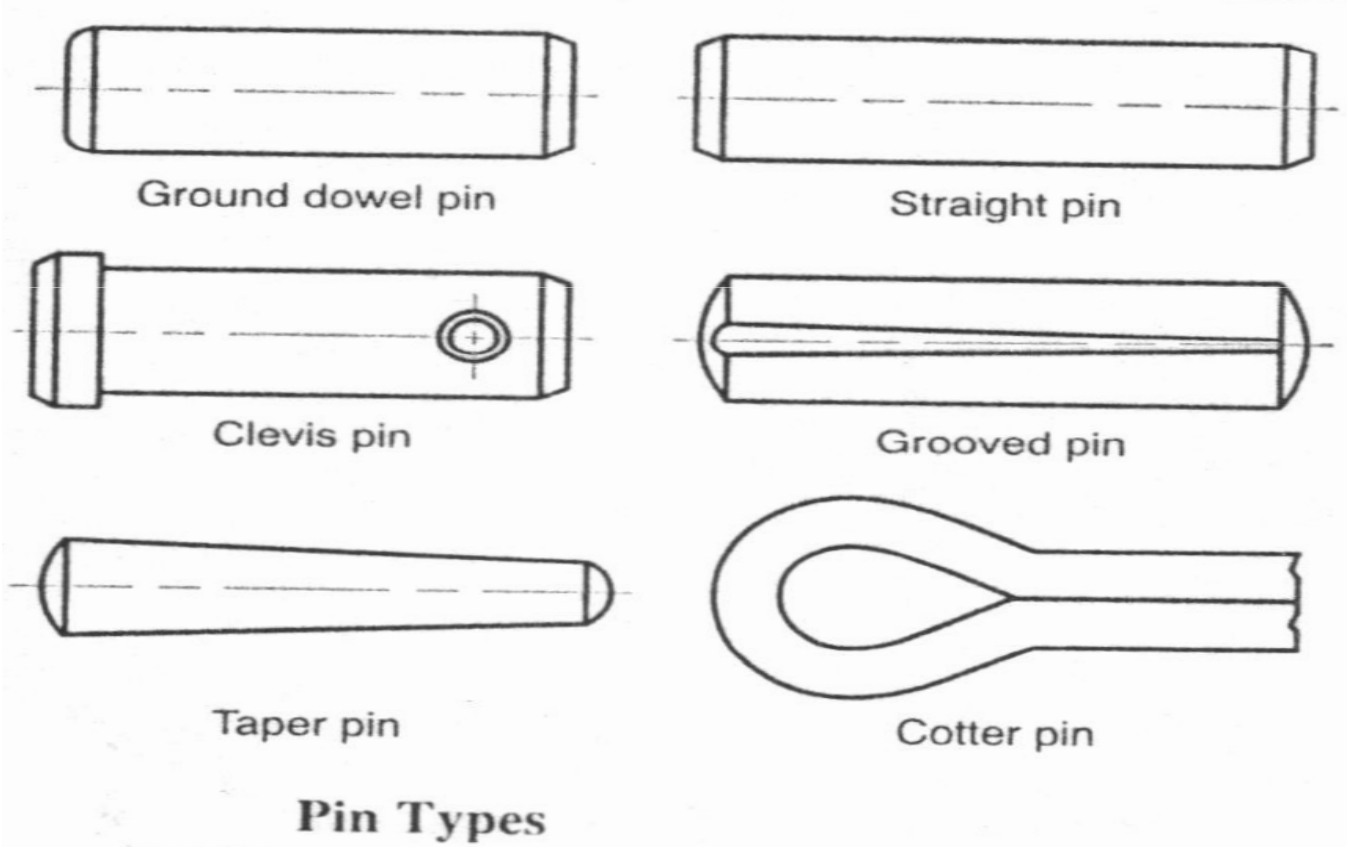
PINS (Pimler Pernolar)



Semipermanent Pins

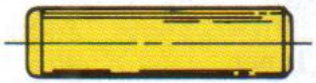
Semipermanent pin fasteners require application of pressure or the aid of tools for installation or removal. The two basic types are machine pins and radial locking pins.

The following general design rules apply to all types of semipermanent pins:

- Avoid conditions in which the direction of vibration parallels the axis of the pin.
- Keep the shear plane of the pin a minimum distance of one diameter from the end of the pin.

Machine Pins

Four types are generally considered to be most commonly used: hardened and ground dowel pins and commercial straight pins, taper pins, clevis pins, and standard cotter pins.

HARDENED AND GROUND DOWEL PIN	TAPER PIN	CLEVIS PIN	COTTER PIN
			
Standardized in nominal diameters ranging from .12 to .88 (3 to 22mm). 1. Holding laminated sections together with surfaces either drawn up tight or separated in some fixed relationship. 2. Fastening machine parts where accuracy of alignment is a primary consideration. 3. Locking components on shafts, in the form of transverse pin key.	Standard pins have a taper of 1:48 measured on the diameter. Basic dimension is the diameter of the large end. Used for light-duty service in the attachment of wheels, levers, and similar components to shafts. Torque capacity is determined on the basis of double shear, using the average diameter along the tapered section in the shaft for area calculations.	Standard nominal diameters for clevis pins range from .19 to 1.00 (5 to 25mm). Basic function of the clevis pin is to connect mating yoke, or fork, and eye members in knuckle-joint assemblies. Held in place by a small cotter pin or other fastening means, it provides a mobile joint construction, which can be readily disconnected for adjustment or maintenance.	Sizes have been standardized in nominal diameters ranging from .03 to .75 (1 to 20mm). Locking device for other fasteners. Used with a castle or slotted nut on bolts, screws, or studs, it provides a convenient, low-cost locknut assembly. Hold standard clevis pins in place. Can be used with or without a plain washer as an artificial shoulder to lock parts in position on shafts.

Radial Locking Pins

Two basic pin forms are employed: solid with grooved surfaces and hollow spring pins, which may be either slotted or spiral-wrapped

Grooved Straight Pins Locking action of the grooved pin is provided by parallel, longitudinal grooves uniformly spaced around the pin surface. Rolled or pressed into solid pin stock, the grooves expand the effective pin diameter. When the pin is driven into a drilled hole corresponding in size to nominal pin diameter, elastic deformation of the raised groove edges produces a secure force-fit with the hole wall.

SOLID WITH GROOVED SURFACES

TYPE A

Full-length grooves. Used for general purpose fastening.

TYPE B

Grooves extend half length of the pin. Used as a hinge or linkage "bolt" but also can be employed for other functions in through-drilled holes where a locking fit over only part of the pin length is required.

TYPE E

Half-length groove section centered along the pin surface. Used as a cotter pin or in similar functions where an artificial shoulder or a locking fit over the center portion of the pin is required.

TYPE A3

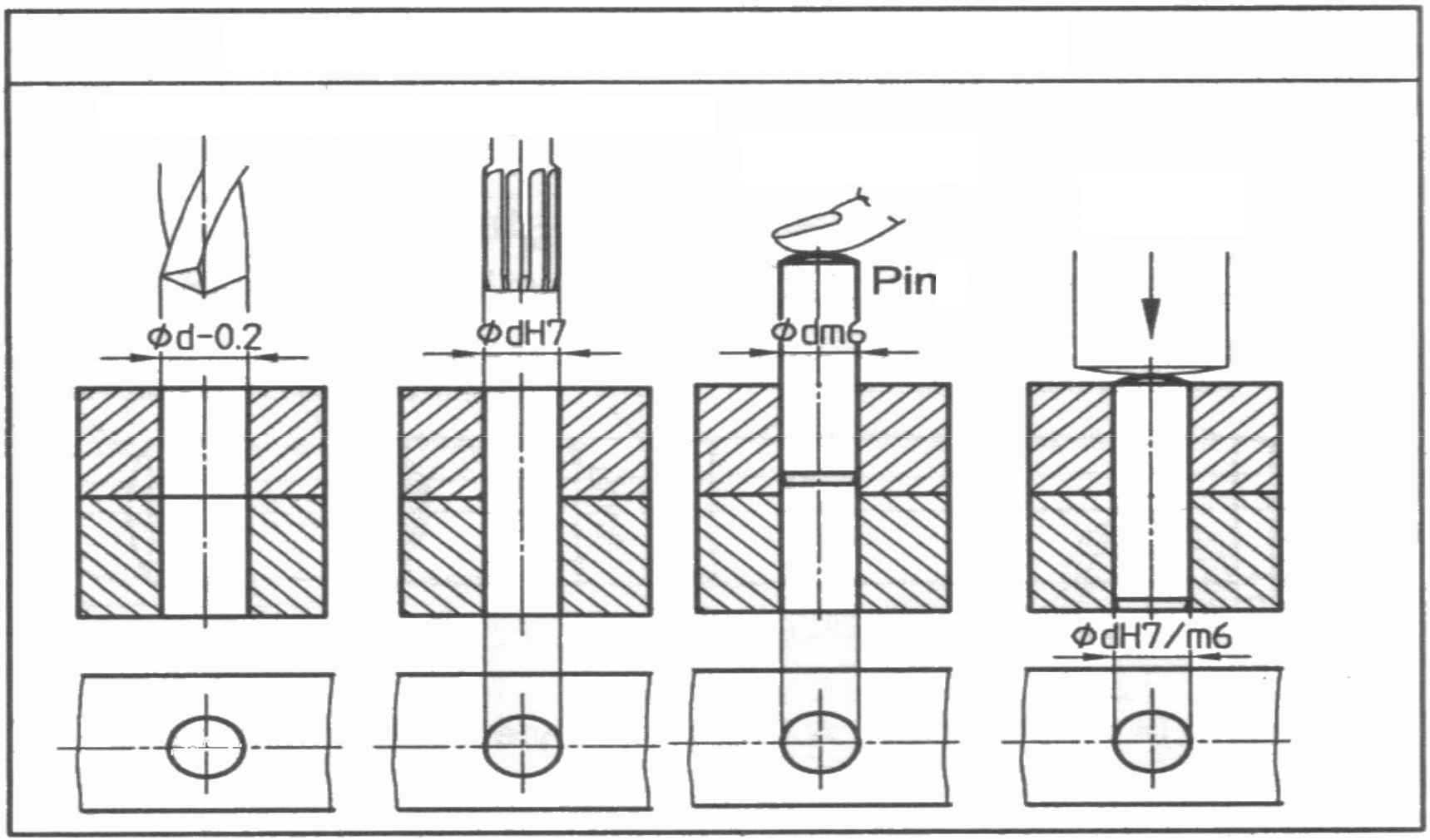
Full-length grooves with pilot section at one end to facilitate assembly. Expanded dimension of this pin is held to a maximum over the full grooved length to provide uniform locking action. It is recommended for applications subject to severe vibration or shock loads where maximum locking effect is required.

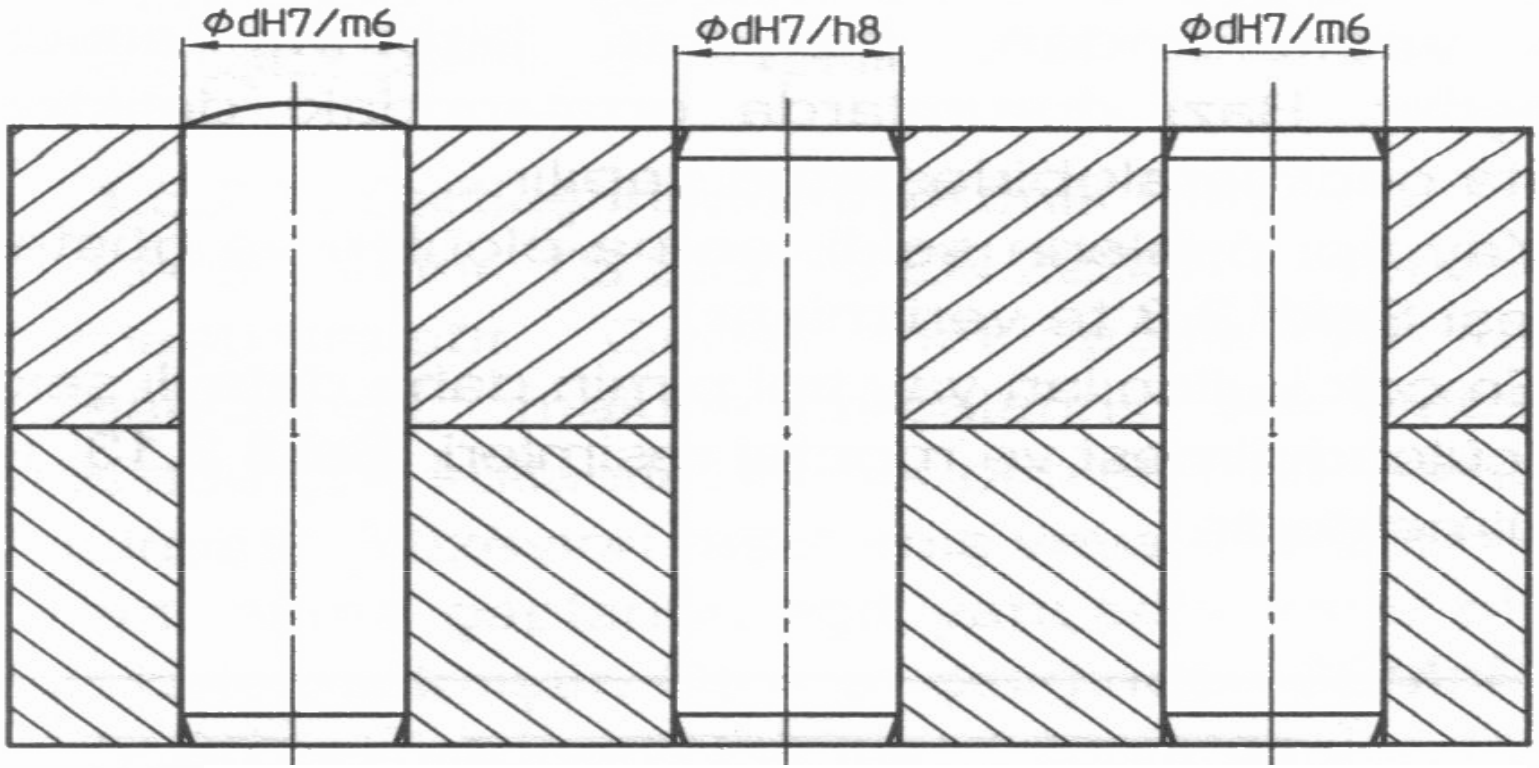
TYPE D

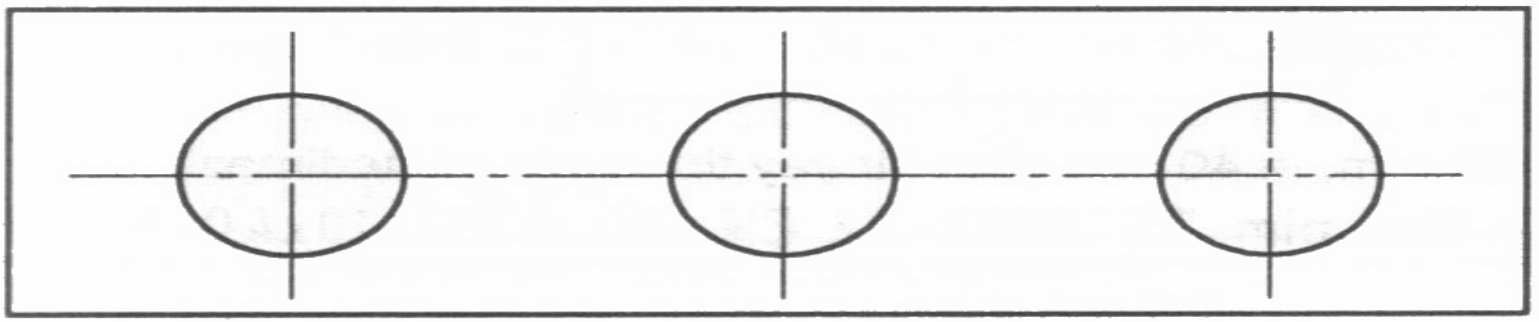
Reverse tapered grooves extend half the pin length. It is the counterpart of the Type B pin for assembly in blind holes.

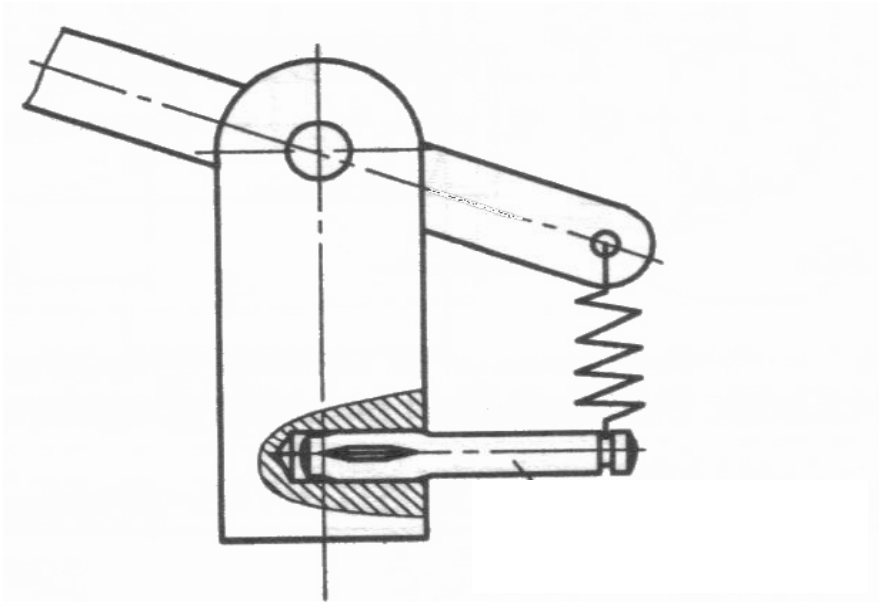
TYPE U

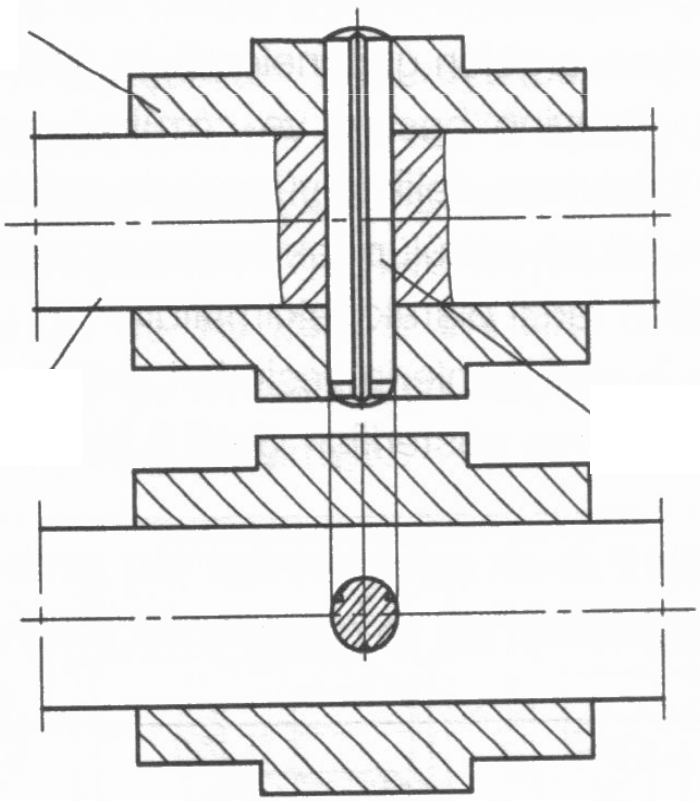
Full-length grooves with pilot section at both ends for hopper feeding. Same as Type C.

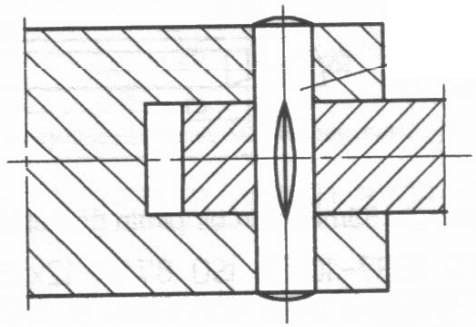

Pin
Φd-0.2
ΦdH7
Φdm6
ΦdH7/m6

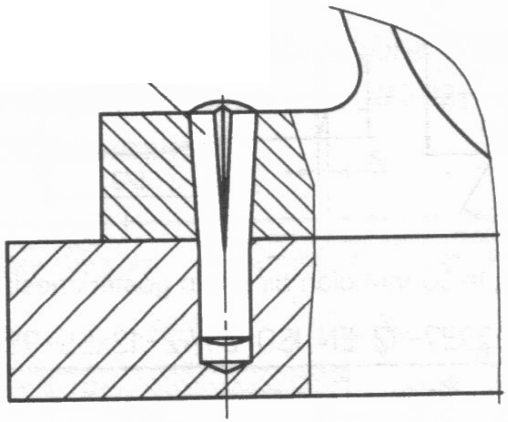

ΦdH7/m6
ΦdH7/h8
ΦdH7/m6

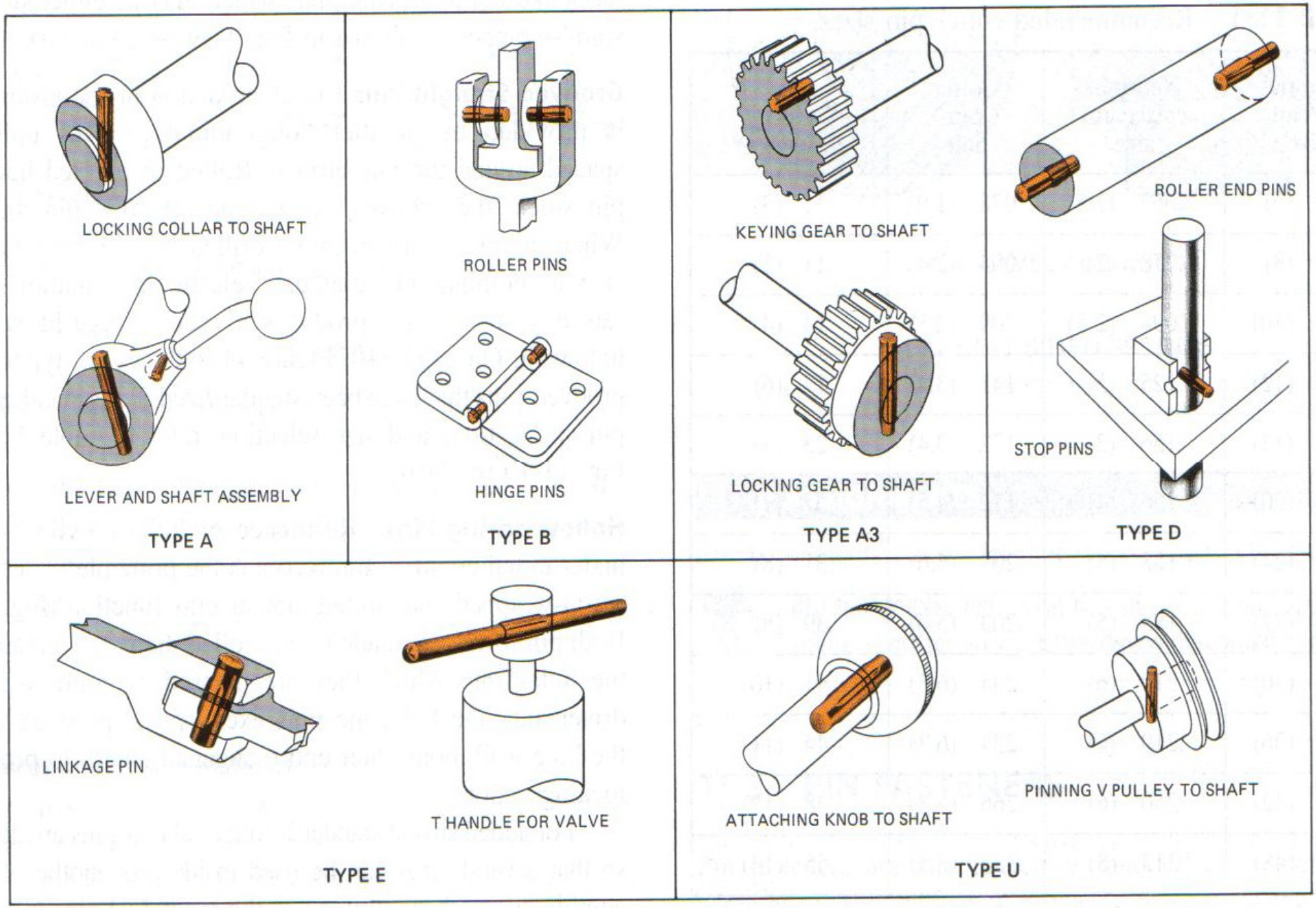










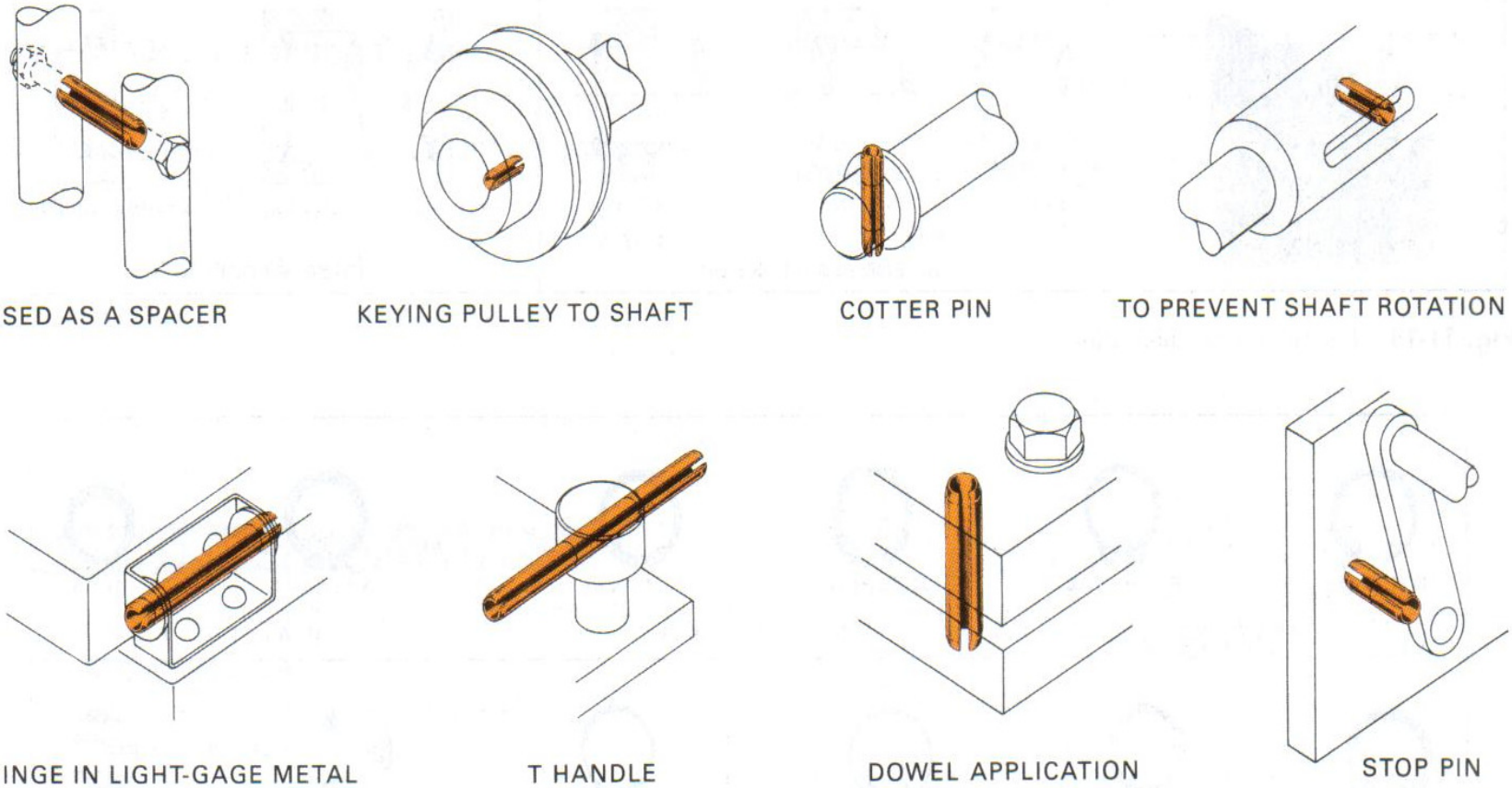


Groove pin applications.

Recommended groove pin sizes.

Shaft Dia in. (mm)	Transverse key		Longitudinal Key
	Pin Dia in. (mm)	Taper Pin no.	Pin Dia in. (mm)
.375 (10)	.125 (3)	3/0	.094 (2.5)
.438 (12)	.156 (4)	0	.125 (3)
.500 (14)	.156 (5)	0	.125 (4)
.562 (16)	.188 (5)	2	.156 (4)
.625 (18)	.188 (6)	2	.156 (5)
.750 (20)	.250 (6)	4	.156 (5)
.875 (22)	.250 (6)	4	.219 (6)
1.000 (24)	.312 (8)	6	.250 (6)
1.062 (26)	.312 (8)	6	— —
1.125 (28)	.375 (10)	7	— —
1.188 (30)	.375 (10)	7	— —
1.250 (32)	.375 (10)	7	.312 (8)
1.375 (34)	.438 (11)	7	.375 (10)
1.438 (36)	.438 (11)	7	— —
1.500 (38)	.500 (12)	8	.438 (11)

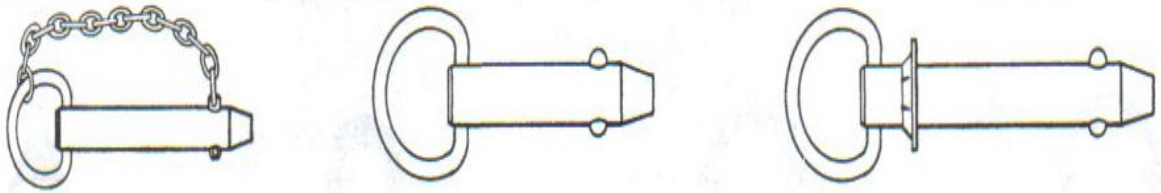
Hollow Spring Pins Resilience of hollow cylinder walls under radial compression forces is the principle under which spiral-wrapped and slotted tubular pins function
Both pin forms are made to controlled diameters greater than the holes into which they are pressed. Compressed when driven into the hole, the pins exert spring pressure against the hole wall along their entire engaged length to produce a locking action.



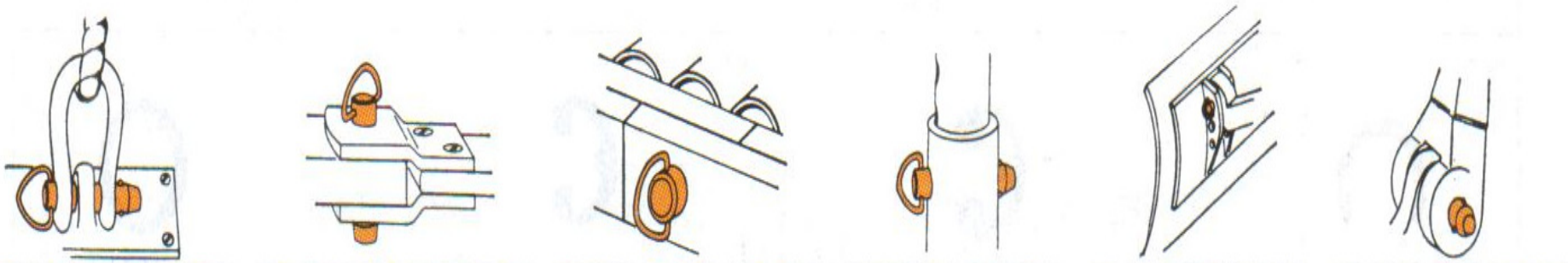
Spring pin applications.

Quick-Release Pins

Commercially available **quick-release pins** vary widely in head styles, types of locking and release mechanisms, and range of pin lengths



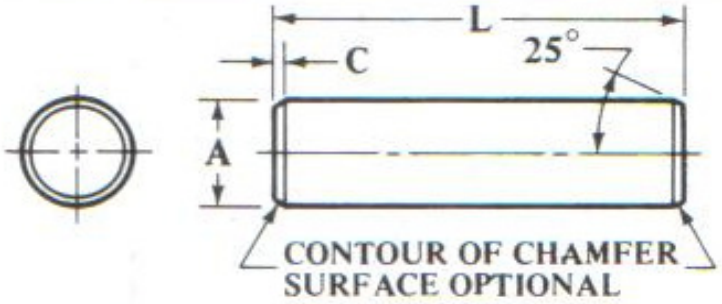
(A) COMMON TYPES



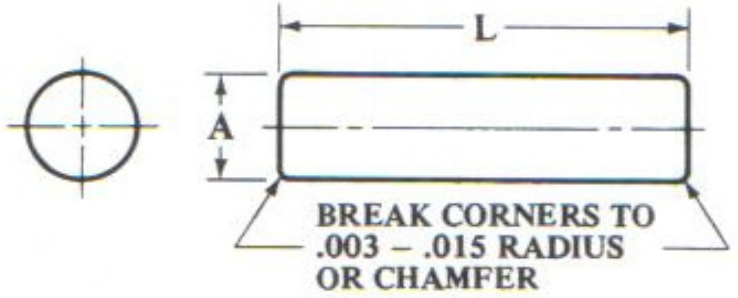
(B) APPLICATIONS

Quick-release pins.

American National Standard Chamfered and Square End Straight Pins
(ANSI B18.8.2–1978)



CHAMFERED STRAIGHT PIN



SQUARE END STRAIGHT PIN

Nominal Size[1] or Basic Pin Diameter		Pin Diameter, *A*		Chamfer Length, *C*	
		Max	Min	Max	Min
1/16	0.062	0.0625	0.0605	0.025	0.005
3/32	0.094	0.0937	0.0917	0.025	0.005
7/64	0.109	0.1094	0.1074	0.025	0.005
1/8	0.125	0.1250	0.1230	0.025	0.005
5/32	0.156	0.1562	0.1542	0.025	0.005
3/16	0.188	0.1875	0.1855	0.025	0.005
7/32	0.219	0.2187	0.2167	0.025	0.005
1/4	0.250	0.2500	0.2480	0.025	0.005

Nominal Size[1] or Basic Pin Diameter		Pin Diameter, *A*		Chamfer Length, *C*	
		Max	Min	Max	Min
5/16	0.312	0.3125	0.3105	0.040	0.020
3/8	0.375	0.3750	0.3730	0.040	0.020
7/16	0.438	0.4375	0.4355	0.040	0.020
1/2	0.500	0.5000	0.4980	0.040	0.020
5/8	0.625	0.6250	0.6230	0.055	0.035
3/4	0.750	0.7500	0.7480	0.055	0.035
7/8	0.875	0.8750	0.8730	0.055	0.035
1	1.000	1.0000	0.9980	0.055	0.035

All dimensions are in inches.
[1] Where specifying nominal size in decimals, zeros preceding decimal point are omitted.

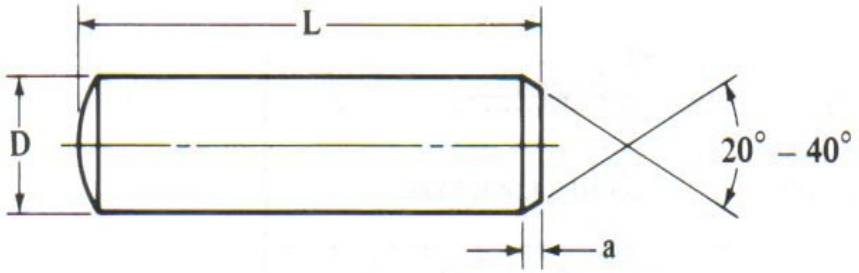
American National Standard Taper Pins (ANSI B18.8.2–1978, R1989)

Pin Size Number and Basic Pin Diameter[1]	Major Diameter (Large End), *A*				End Crown Radius, *R*		Range of Lengths,[2] *L*	
	Commercial Class		Precision Class					
	Max	Min	Max	Min	Max	Min	Stand. Reamer Avail.[3]	Other
7/0 0.0625	0.0638	0.0618	0.0635	0.0625	0.072	0.052	. . .	1/4–1
6/0 0.0780	0.0793	0.0773	0.0790	0.0780	0.088	0.068	. . .	1/4–1 1/2
5/0 0.0940	0.0953	0.0933	0.0950	0.0940	0.104	0.084	1/4–1	1 1/4, 1 1/2
4/0 0.1090	0.1103	0.1083	0.1100	0.1090	0.119	0.099	1/4–1	1 1/4–2
3/0 0.1250	0.1263	0.1243	0.1260	0.1250	0.135	0.115	1/4–1	1 1/4–2
2/0 0.1410	0.1423	0.1403	0.1420	0.1410	0.151	0.131	1/2–1 1/4	1 1/2–2 1/2
0 0.1560	0.1573	0.1553	0.1570	0.1560	0.166	0.146	1/2–1 1/4	1 1/2–3
1 0.1720	0.1733	0.1713	0.1730	0.1720	0.182	0.162	3/4–1 1/4	1 1/2–3
2 0.1930	0.1943	0.1923	0.1940	0.1930	0.203	0.183	3/4–1 1/2	1 3/4–3
3 0.2190	0.2203	0.2183	0.2200	0.2190	0.229	0.209	3/4–1 3/4	2–4
4 0.2500	0.2513	0.2493	0.2510	0.2500	0.260	0.240	3/4–2	2 1/4–4
5 0.2890	0.2903	0.2883	0.2900	0.2890	0.299	0.279	1–2 1/2	2 3/4–6
6 0.3410	0.3423	0.3403	0.3420	0.3410	0.351	0.331	1 1/4–3	3 1/4–6
7 0.4090	0.4103	0.4083	0.4100	0.4090	0.419	0.399	1 1/4–3 3/4	4–8
8 0.4920	0.4933	0.4913	0.4930	0.4920	0.502	0.482	1 1/4–4 1/2	4 3/4–8
9 0.5910	0.5923	0.5903	0.5920	0.5910	0.601	0.581	1 1/4–5 1/4	5 1/2–8
10 0.7060	0.7073	0.7053	0.7070	0.7060	0.716	0.696	1 1/2–6	6 1/4–8
11 0.8600	0.8613	0.8593	. . .	. . .	0.870	0.850	. . .	2–8
12 1.0320	1.0333	1.0313	. . .	. . .	1.042	1.022	. . .	2–9
13 1.2410	1.2423	1.2403	. . .	. . .	1.251	1.231	. . .	3–11
14 1.5210	1.5223	1.5203	. . .	. . .	1.531	1.511	. . .	3–13

All dimensions are in inches.
For nominal diameters, *B*, see Table 6.
[1] When specifying nominal pin size in decimals, zeros preceding the decimal and in the fourth decimal place are omitted.
[2] Lengths increase in 1/8-inch steps up to 1 inch and in 1/4-inch steps above 1 inch.
[3] Standard reamers are available for pin lengths in this column.

SOURCE: Reprinted courtesy of The American Society of Mechanical Engineers.

British Standard Parallel Steel Dowel Pins — Metric Series (BS 1804: Part 2: 1968)



Nom. Length *L*, mm	Nominal Diameter *D*, mm													
	1	1.5	2	2.5	3	4	5	6	8	10	12	16	20	25
	Chamfer *a* max, mm													
	0.3	0.3	0.3	0.4	0.45	0.6	0.75	0.9	1.2	1.5	1.8	2.5	3	4
	Standard Sizes													
4	0	0												
6	0	0	0	0										
8	0	0	0	0	0									
10		0	0	0	0	0								
12		0	0	0	0	0	0							
16			0	0	0	0	0	0	0					
20				0	0	0	0	0	0	0				
25					0	0	0	0	0	0	0			
30						0	0	0	0	0	0	0		
35							0	0	0	0	0	0		
40							0	0	0	0	0	0	0	
45								0	0	0	0	0	0	
50									0	0	0	0	0	0
60									0	0	0	0	0	0
70										0	0	0	0	0
80										0	0	0	0	0
90											0	0	0	0
100												0	0	0
110												0	0	0
120													0	0

Limits of Tolerance on Diameter							
Nom. Diam., mm		Grade*					
		1		2		3	
		Tolerance Zone					
		m5		h7		h11	
Over	To & Incl.	Limits of Tolerance, 0.001 mm					
	3	+7	+2	0	−12†	0	−60
3	6	+9	+4	0	−12	0	−75
6	10	+12	+6	0	−15	0	−90
10	14	+15	+7	0	−18	0	−110
14	18	+15	+7	0	−18	0	−110
18	24	+17	+8	0	−21	0	−130
24	30	+17	+8	0	−21	0	−130

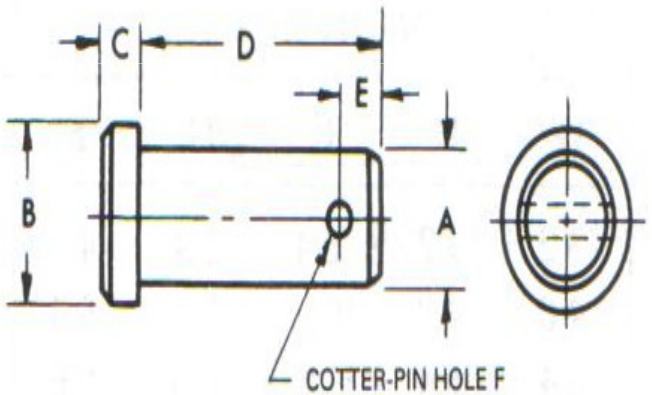
* The limits of tolerance for grades 1 and 2 dowel pins have been chosen to provide satisfactory assembly when used in standard reamed holes (H7 and H8 tolerance zones). If the assembly is not satisfactory, BS 1916: Part 1, Limits and Fits for Engineering should be consulted, and a different class of fit chosen.

† This tolerance is larger than that given in BS 1916, and has been included because the use of a closer tolerance would involve precision grinding by the manufacturer, which is uneconomic for a grade 2 dowel pin.

The tolerance limits on the overall length of all grades of dowel pin up to and including 50 mm long are +0.5, −0.0 mm, and for pins over 50 mm long, are +0.8, −0.0 mm. The Standard specifies that the roughness of the cylindrical surface of grades 1 and 2 dowel pins, when assessed in accordance with BS 1134, shall not be greater than 0.4 μm CLA (16 CLA).

SOURCE: Reprinted courtesy of The American Society of Mechanical Engineers.

U.S. CUSTOMARY (INCHES)						METRIC (MILLIMETERS)					
Pin Dia. A	B	C	Min. D	E	Drill Size F	Pin Dia. A	B	C	Min. D	E	Drill Size F
.188	.31	.06	.59	.11	.078	4	6	1	16	2.2	1
.250	.38	.09	.80	.12	.078	6	10	2	20	3.2	1.6
.312	.44	.09	.97	.16	.109	8	14	3	24	3.5	2
.375	.50	.12	1.09	.16	.109	10	18	4	28	4.5	3.2
.500	.62	.16	1.42	.22	.141	12	20	4	36	5.5	3.2
.625	.81	.20	1.72	.25	.141	16	25	4.5	44	6	4
.750	.94	.25	2.05	.30	.172	20	30	5	52	8	5
1.000	1.19	.34	2.62	.36	.172	24	36	6	66	9	6.3



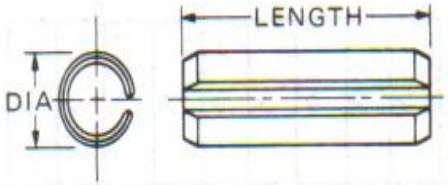
Clevis pins.

NUMBER	7/0	6/0	5/0	4/0	3/0	2/0	0	1	2	3	4	5	6	7	8	9
U.S. CUSTOMARY (INCHES)																
SIZE (LARGE END)	.062	.078	.094	.109	.125	.141	.152	.172	.193	.219	.250	.289	.314	.409	.492	.591
LENGTH .375	x	x														
.500	x	x	x	x	x	x	x									
.625	x	x	x	x	x	x	x									
.750		x	x	x	x	x	x	x	x	x						
.875					x	x	x	x	x	x						
1.000			x	x	x	x	x	x	x	x	x	x				
1.250						x	x	x	x	x	x	x	x			
1.500							x	x	x	x	x	x	x			
1.750								x	x	x	x	x	x			
2.000								x	x	x	x	x	x	x	x	
2.250									x	x	x	x	x	x	x	
2.500									x	x	x	x	x	x	x	
2.750										x	x	x	x	x	x	x

METRIC (MILLIMETERS)																
SIZE (LARGE END)	1.6	2	2.4	2.8	3.2	3.6	4	4.4	4.9	5.6	6.4	7.4	8	10.4	12.5	15
LENGTH 10	x	x														
12	x	x	x	x	x	x	x									
16	x	x	x	x	x	x	x									
20		x	x	x	x	x	x	x	x	x						
22					x	x	x	x	x	x						
25			x	x	x	x	x	x	x	x	x	x				
30						x	x	x	x	x	x	x	x			
40							x	x	x	x	x	x	x			
45								x	x	x	x	x	x			
50								x	x	x	x	x	x	x	x	
55									x	x	x	x	x	x	x	
65									x	x	x	x	x	x	x	
70										x	x	x	x	x	x	x

Taper pins.

Spring pins.



PIN DIAMETER (INCHES)							
Length	.062	.094	.125	.156	.188	.250	.312
.250	x	x					
.375	x	x	x				
.500	x	x	x	x	x		
.625	x	x	x	x	x	x	
.750	x	x	x	x	x	x	x
.875	x	x	x	x	x	x	x
1.00	x	x	x	x	x	x	x
1.250		x	x	x	x	x	x
1.500		x	x	x	x	x	x
1.750			x	x	x	x	x
2.000			x	x	x	x	x
2.225				x	x	x	x
2.500				x	x	x	x
3.000						x	x
3.500						x	x

PIN DIAMETER (MILLIMETERS)										
Length	1.5	2	2.5	3	4	5	6	8	10	12
5	x	x								
10	x	x	x	x						
15	x	x	x	x	x	x				
20	x	x	x	x	x	x	x			
25	x	x	x	x	x	x	x	x		
30		x	x	x	x	x	x	x	x	x
35		x	x	x	x	x	x	x	x	x
40		x	x	x	x	x	x	x	x	x
45				x	x	x	x	x	x	x
50				x	x	x	x	x	x	x
55					x	x	x	x	x	x
60					x	x	x	x	x	x
70							x	x	x	x
75							x	x	x	x
80								x	x	x

U.S. CUSTOMARY (INCHES)							
	PIN DIAMETER						
Length	.09	.125	.188	.250	.312	.375	.500
.250	x	x					
.375	x	x	x				
.500	x	x	x	x			
.625	x	x	x	x	x		
.750	x	x	x	x	x	x	
.875	x	x	x	x	x	x	
1.000	x	x	x	x	x	x	x
1.250	x	x	x	x	x	x	x
1.500		x	x	x	x	x	x
1.750			x	x	x	x	x
2.000			x	x	x	x	x
2.250			x	x	x	x	x
2.275				x	x	x	x
3.000				x	x	x	x

METRIC (MILLIMETERS)								
	PIN DIAMETER							
Length	2	3	4	5	6	8	10	12
5	x	x	x					
10	x	x	x	x	x			
15	x	x	x	x	x	x		
20	x	x	x	x	x	x	x	
25	x	x	x	x	x	x	x	x
30	x	x	x	x	x	x	x	x
35		x	x	x	x	x	x	x
40			x	x	x	x	x	x
45				x	x	x	x	x
50				x	x	x	x	x
55					x	x	x	x
60					x	x	x	x
65					x	x	x	x
70						x	x	x
75						x	x	x

Note: Metric size pins were not available at the time of publication. Sizes were soft converted to allow students to complete drawing assignments.

Groove pins.

Pim standartları

1. Silindirik pimler

- TS 2337-1 EN ISO 2338
- TS 2337-2 EN ISO 8733
- TS 2337-3 EN ISO 8734
- TS 2337-4 EN ISO 8735

2. Konik pimler

- TS 2337-5 EN 22339
- TS 2337-6 EN 28736
- TS 2337-7 EN 28737
- TS 2337-8

3. Yivli pimler

- TS 2337-9 EN ISO 8739
- TS 2337-10 EN ISO 8740
- TS 2337-11 EN ISO 8741
- TS 2337-12 EN ISO 8742
- TS 2337-13 EN ISO 8743
- TS 2337-14 EN ISO 8744
- TS 2337-15 EN ISO 8745
- TS 2337-16 EN ISO 8746
- TS 2337-17 EN ISO 8747
- TS 2337-18

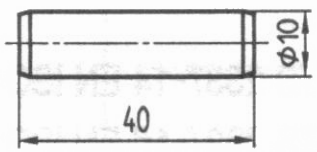
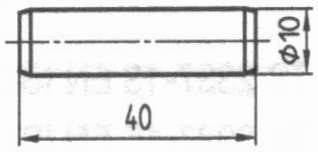
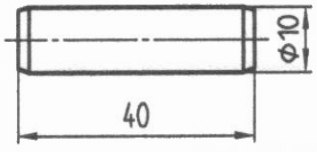
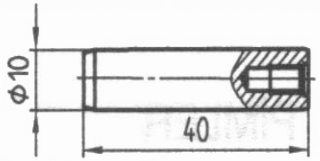
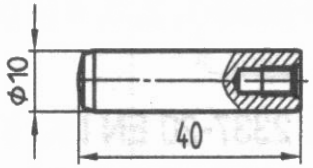
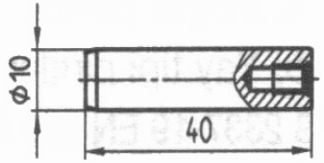
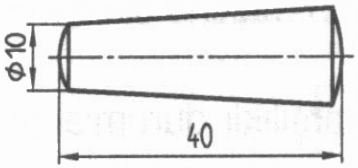
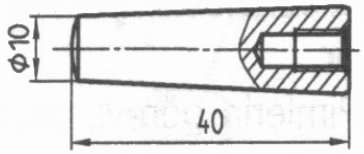
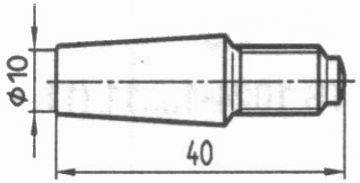
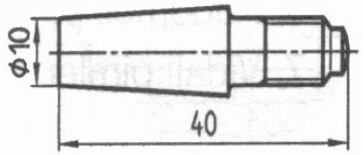
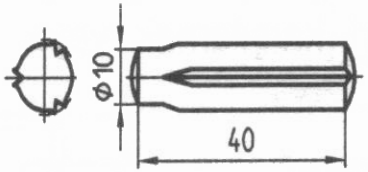
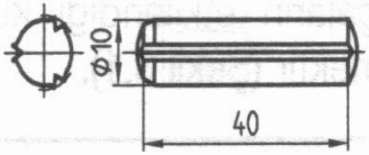
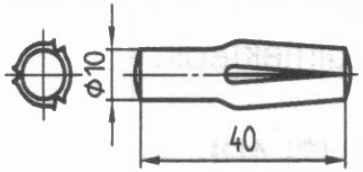
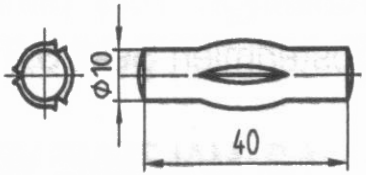
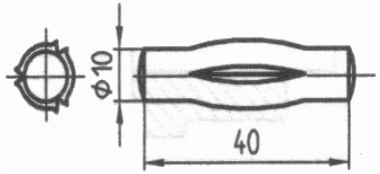
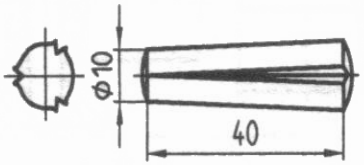
4. Maşalı pimler - TS 2339-1, 2, 3, 4 (4 çeşit)

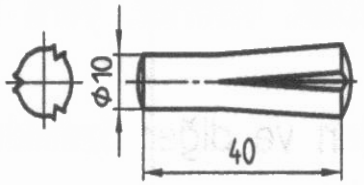
5. Yay tipi pimler

- TS 2337-19 EN ISO 8748
- TS 2337-20 EN ISO 8750
- TS 2337-21 EN ISO 8751
- TS 2337-22 EN ISO 8752
- TS 2337-23 EN ISO 13337

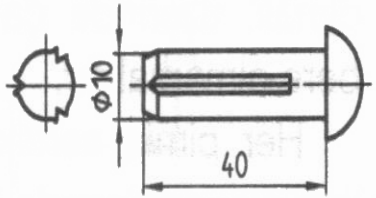
6. Kademeli pimler - TS 7939

7. Vidalı pimler - TS 1024-1....11 (11 çeşit)

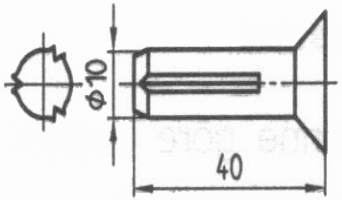
 Pim TS 2337-1 EN ISO 2338-10m6x40	 Pim TS 2337-3 EN ISO 8734-10x40-A	 Pim TS 2337-3 EN ISO 8734 -10m6x40-B	 Pim TS 2337-2 EN ISO 8733-10x40
 Pim TS 2337-4 EN ISO 8735-10m6x40-A	 Pim TS 2337-4 EN ISO 8735-10m6x40-B	 Pim TS 2337-5 EN 22339-A-10x40	 Pim TS 2337-6 EN 28736-A-10x40
 Pim TS 2337-7 EN 28737-10x40	 Pim TS 2337-8 -10x40	 Pim TS 2337-9 EN ISO 8739 -10x40	 Pim TS 2337-10 EN ISO 8740-10x40
 Pim TS 2337-11 EN ISO 8741-10x40	 Pim TS 2337-12 EN ISO 8742-10x40	 Pim TS 2337-13 EN ISO 8743-10x40	 Pim TS 2337-14 EN ISO 8744-10x40



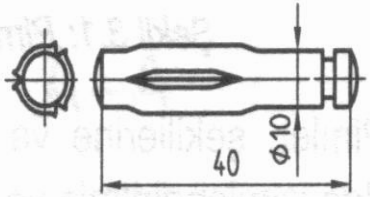
Pim TS 2337-15 EN ISO 8745-10x40



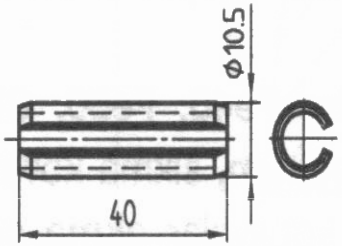
Pim TS 2337-16 EN ISO 8746-A-10x40



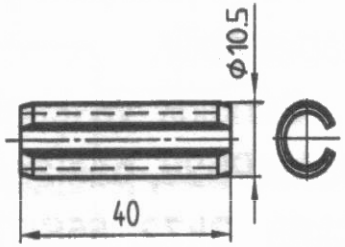
Pim TS 2337-17 EN ISO 8747-A-10x40



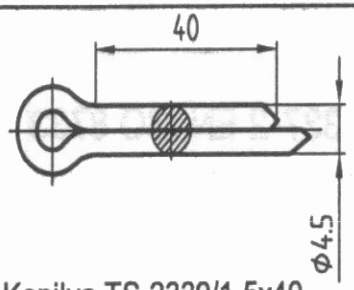
Pim TS 2337-18 -A-10x40



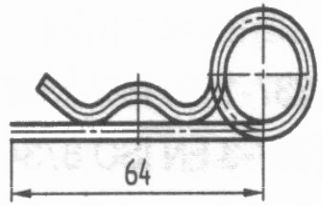
Yay tipi pim TS 2337-22 EN ISO 8752-10x40



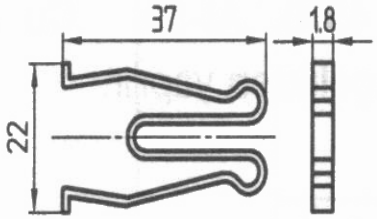
Yay tipi pim TS 2337-23 EN ISO 13337-10x40



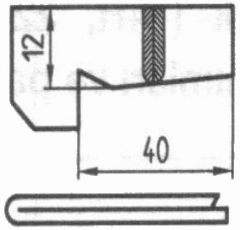
Kopilya TS 2339/1-5x40



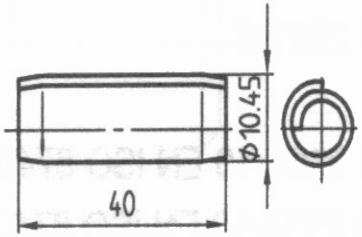
Kopilya TS 2339/2-3.6



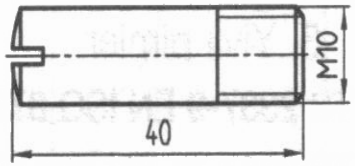
Kopilya TS 2339/3-37



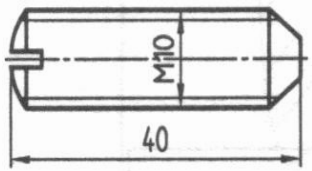
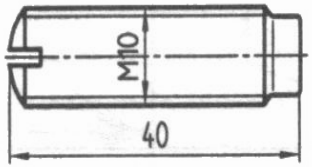
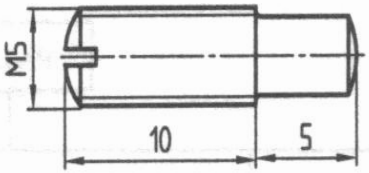
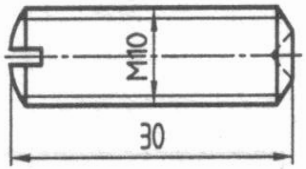
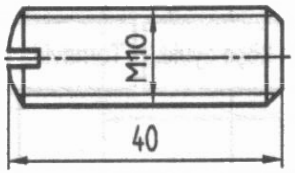
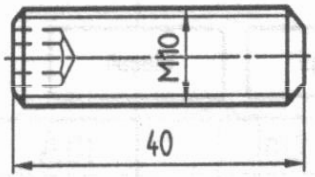
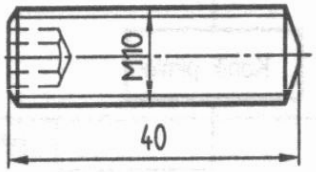
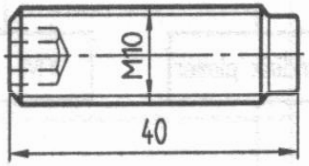
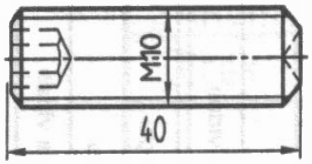
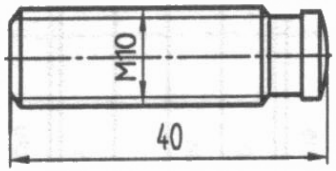
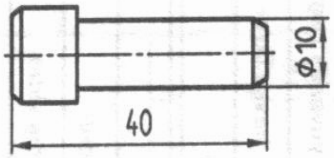
Kopilya TS 2339/4-A12x40



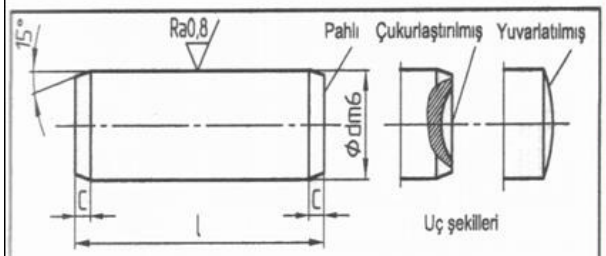
Yay tipi pim TS 2337-219 EN ISO 8748-10x40



Vidalı Pim TS 1024/1-M10x40

 Vidalı Pim TS 1024/2-M10x40	 Vidalı Pim TS 1024/3-M10x40	 Vidalı Pim TS 1024/4-M5x10x5	 Vidalı Pim TS 1024/5-M10x30
 Vidalı Pim TS 1024/6-M10x40	 Vidalı Pim TS 1024/7-M10x40	 Vidalı Pim TS 1024/8-M10x40	 Vidalı Pim TS 1024/9-M10x40
 Vidalı Pim TS 1024/10-M10x40	 Vidalı Pim TS 1024/11-M10x40	 Pim TS 7939-10x40	

A tipi pimlerin tamamı sertleştirilmiş, B tipi pimlerin ise sadece dış yüzeyleri sertleştirilmiştir.

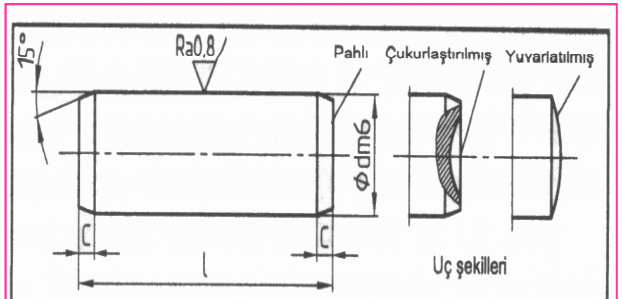


d=10 mm, l= 40 mm olan, A tipi,tamamiyle sertleştirilmiş bir pimin gösterilmesi:

Silindirik pim TS 2337-3 EN ISO 8734-10x40-A-Fe

d	3	4	5	6	8	10	12	16	20
c	0,5	0,63	0,8	1,2	1,6	2	2,5	3	3,5
l	8 30	10 40	12 50	14 60	18 80	22 120	26 120	40 180	50 200

Fully hardened

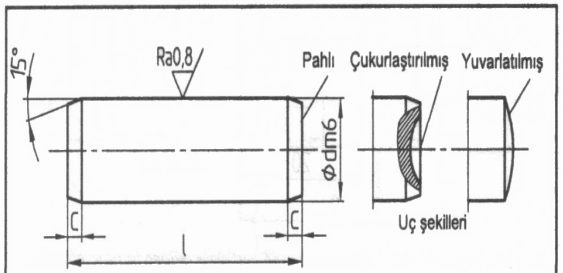


d=10 mm, l= 40 mm olan, B tipi,yüzeyi sertleştirilmiş bir pimin gösterilmesi:

Silindirik pim TS 2337-3 EN ISO 8734-10x40-B-Fe

d	3	4	5	6	8	10	12	16	20
c	0,5	0,63	0,8	1,2	1,6	2	2,5	3	3,5
l	8 30	10 40	12 50	14 60	18 80	22 120	26 120	40 180	50 200

Surface hardened



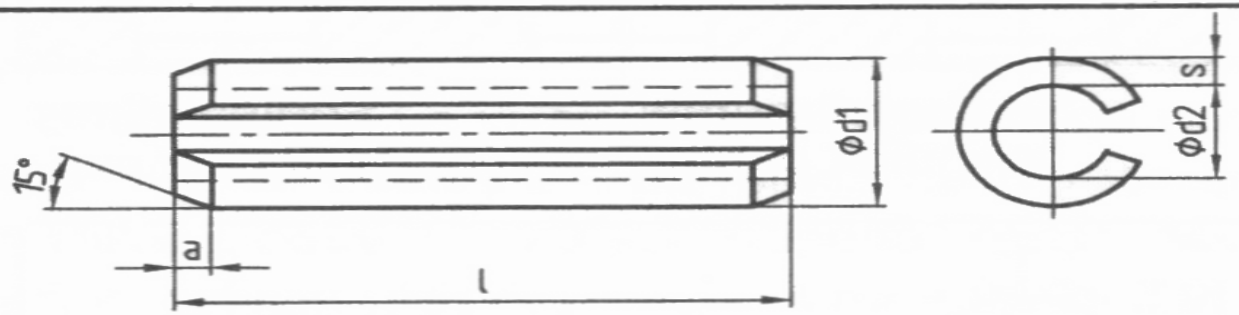
Tolerans sınıfı h8 olan pimde: Ra=1,6 dır.

d=10 mm, l= 40 mm olan, sertleştirilmemiş çelikten,tolerans sınıfı m6 olan pimin gösterilişi:

Silindirik pim TS 2337-1 EN ISO 2338-10m6x40-Fe

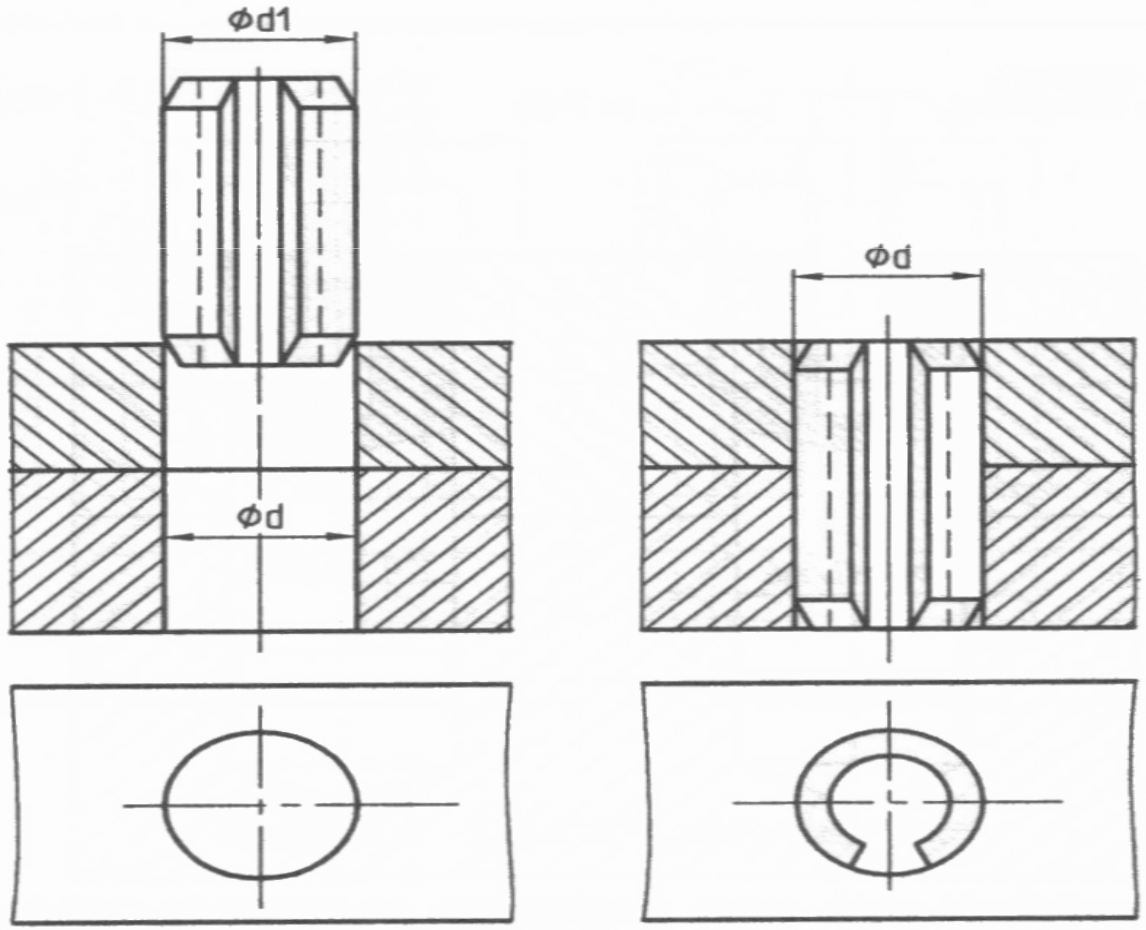
d	3	4	5	6	8	10	12	16	20
c	0,5	0,63	0,8	1	1,2	1,6	2	2,5	3
l	8 30	8 40	10 50	12 60	14 80	18 95	22 140	26 180	35 200

Non hardened

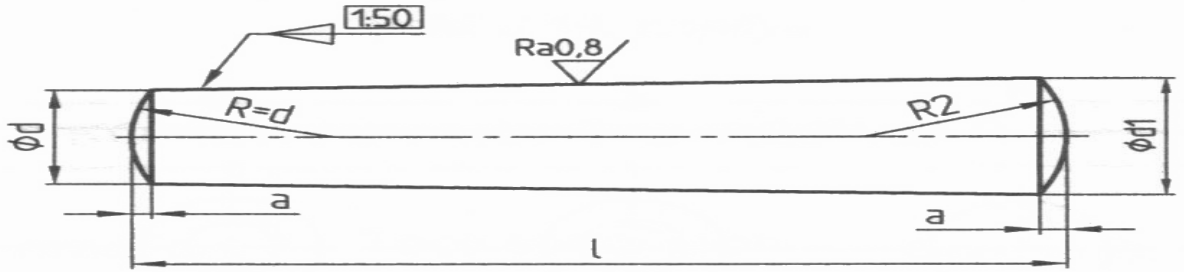


d=10 mm, l= 40 mm olan bir yay tipi pimin gösterilmesi;

Yay tipi pim TS 2337-22 EN ISO 8752-10x40-55Si7



Tip A (taşlanmış pimler): Yüzey pürüzlülüğü Ra=0,8
Tip B (tornalanmış pimler): Yüzey pürüzlülüğü Ra=3,2

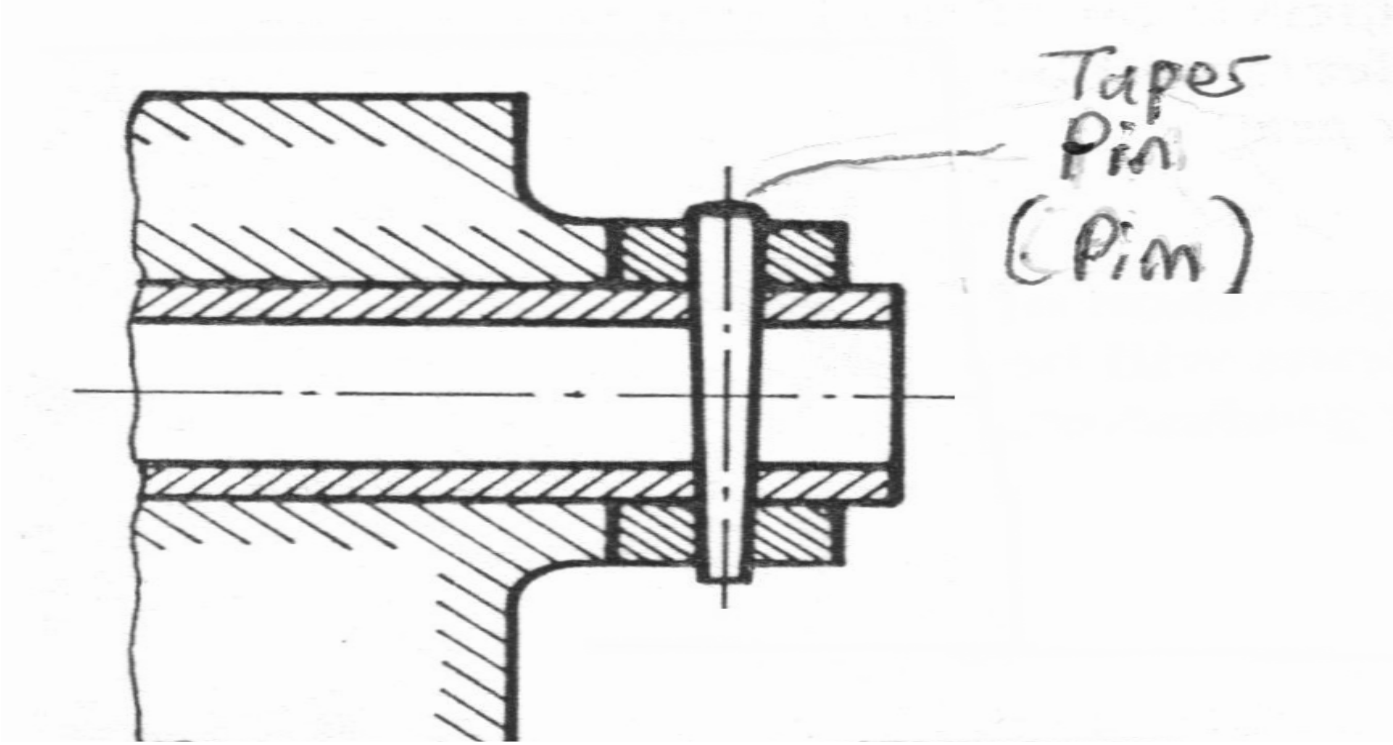


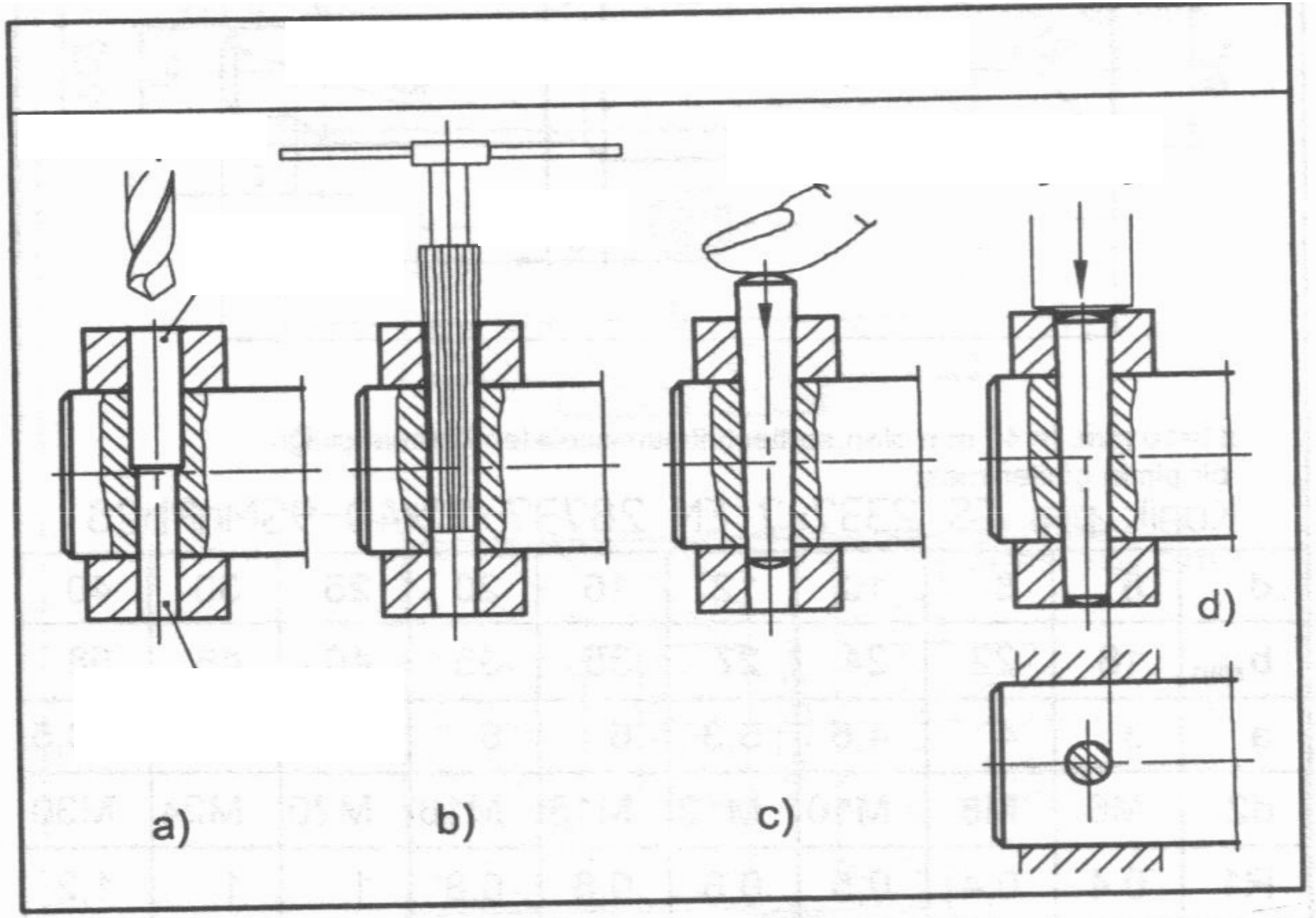
$$R2 = \frac{a}{2} + d + \frac{(0{,}02.l)^2}{8a} \qquad d1 = d + \frac{l}{50}$$

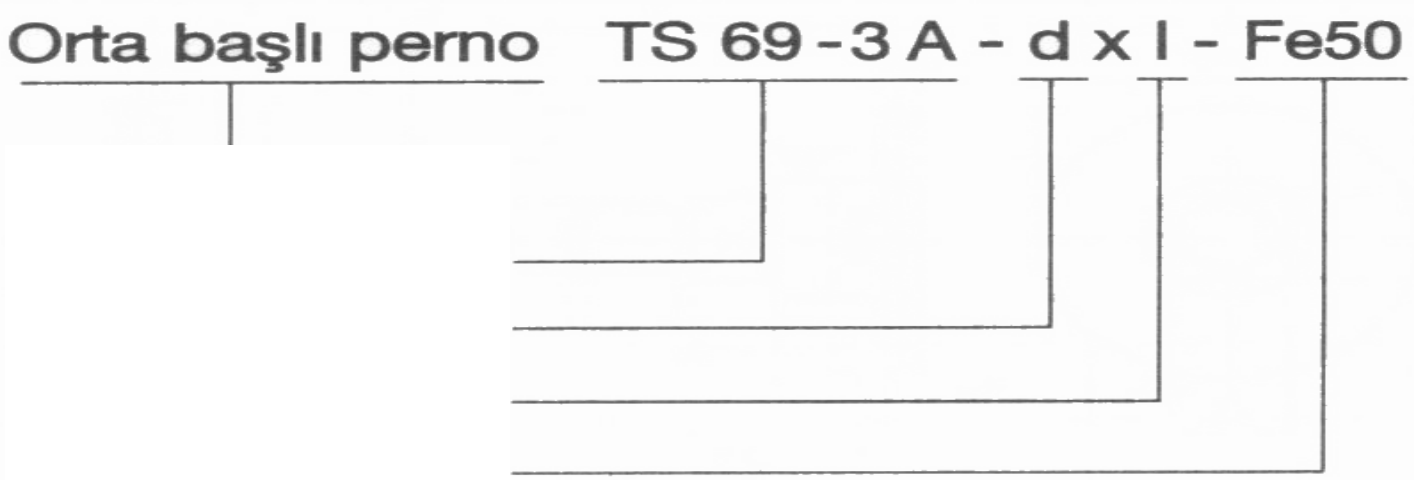
d=10 mm, l= 40 mm olan,sertleştirilmemiş çelikten,A tipi bir pimin gösterilmesi:

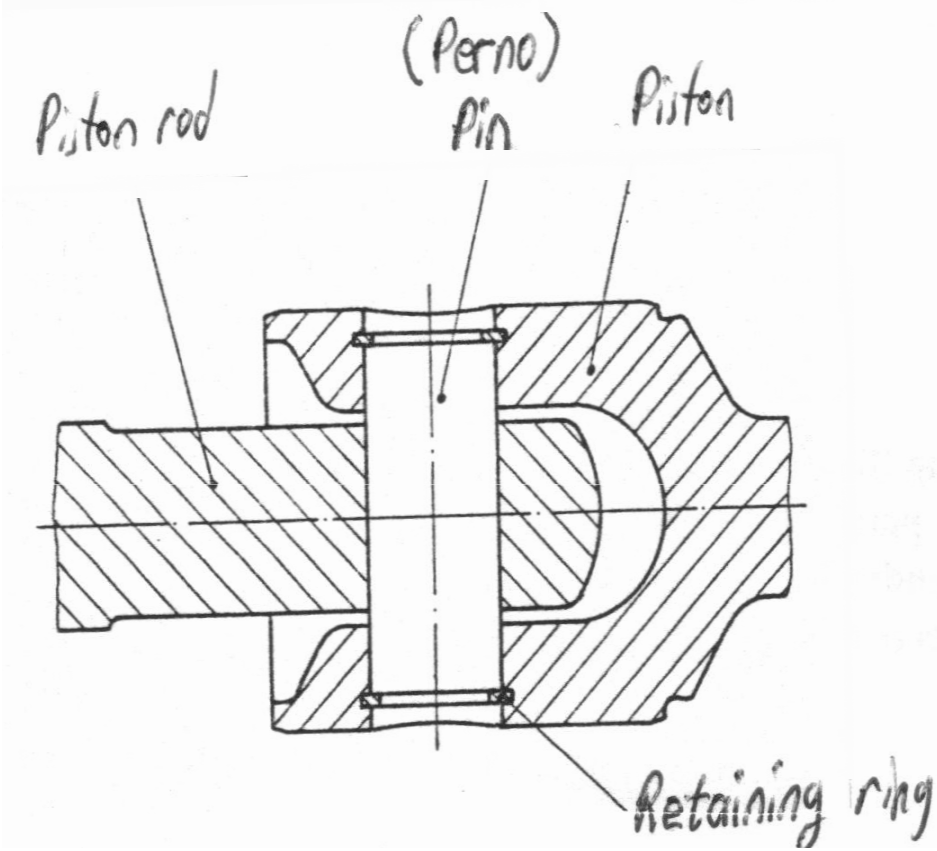
Pim TS 2337-5 EN 22339-A-10x40-Fe

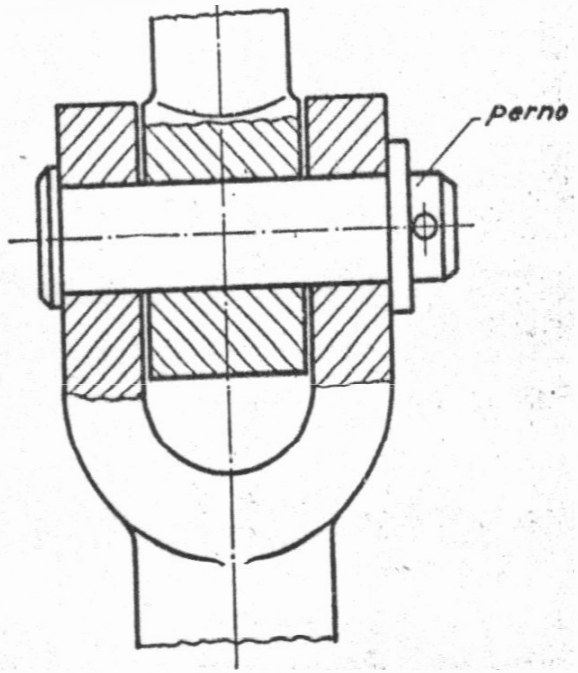
d	3	4	5	6	8	10	12	16	20
a	0,4	0,5	0,63	0,8	1	1,2	1,6	2	2,5
l	12 45	12 55	18 60	22 90	22 140	24 160	26 180	30 200	40 200



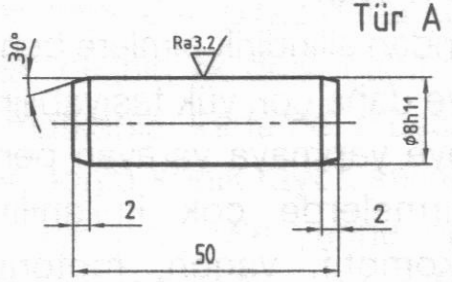

a)
b)
c)
d)


Orta başlı perno
TS 69-3 A - d x l - Fe50

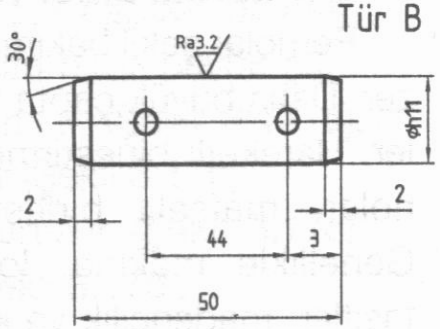

Piston rod
(Perno)
Pin
Piston
Retaining ring


perno

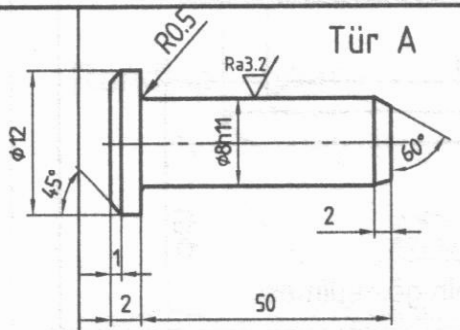
ÇEŞİTLİ PERNO RESİMLERİ , GÖSTERİLMESİ VE ÖLÇÜLENDİRME TS 69



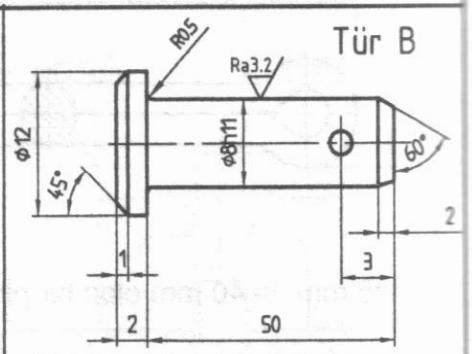
Başsız perno TS 69-1 A -10x40 - Fe50



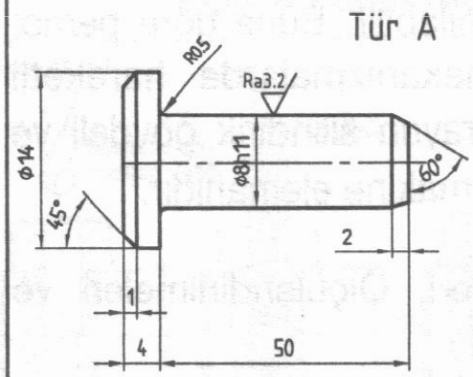
Başsız perno TS 69-1 B -10x40 - Fe50



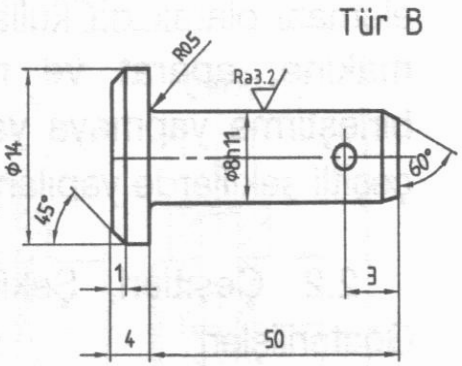
Küçük başlı perno TS 69-2 A -8x50 - Fe50



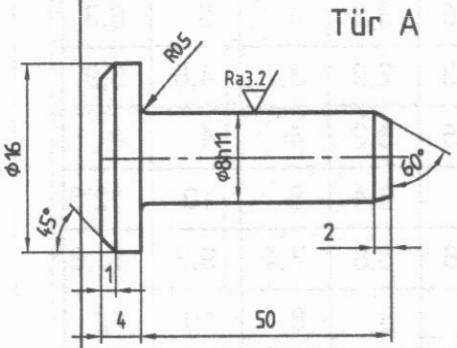
Küçük başlı perno TS 69-2 B -8x50 - Fe50



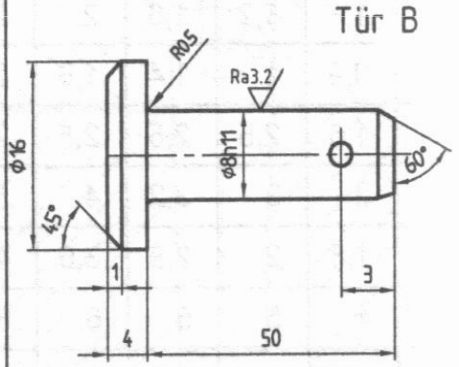
Orta başlı perno TS 69-3 A -8x50 - Fe50



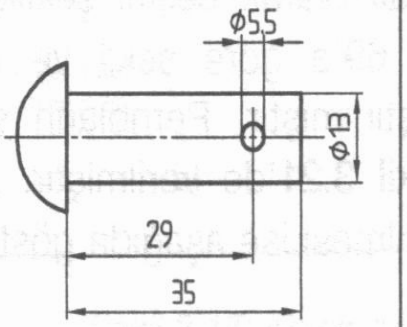
Orta başlı perno TS 69-3 B -8x50 - Fe50



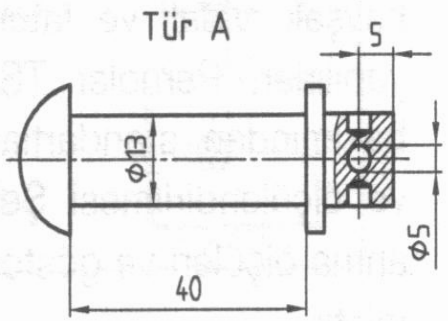
Büyük başlı perno TS 69-4 A -8x50 - Fe50



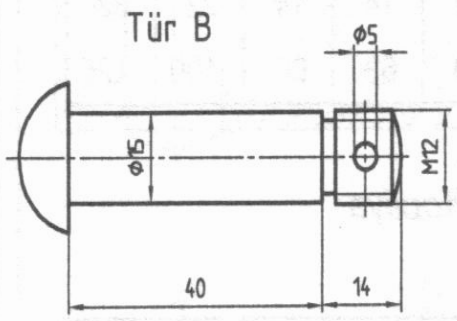
Büyük başlı perno TS 69-4 B -8x50 - Fe50



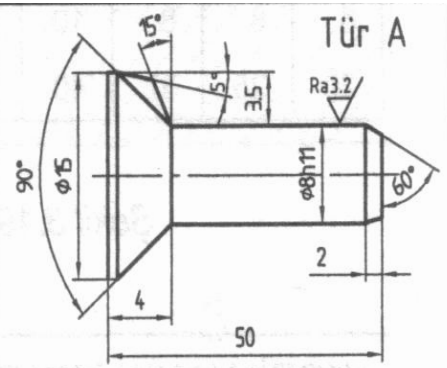
Bombe başlı perno TS 69-5 13x35 - Fe34



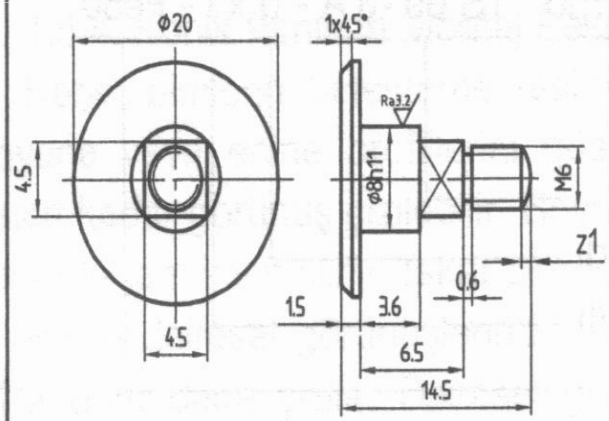
Bombe başlı faturalı perno
TS 69-6A- 15x40 - Fe 50



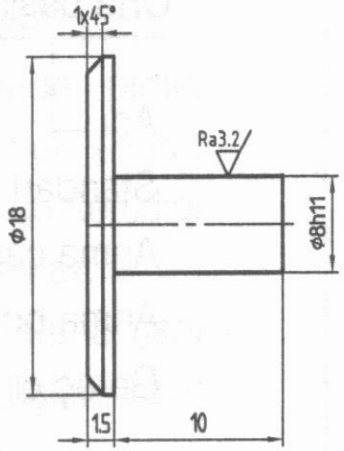
Bombe başlı vidalı perno
TS 69-6B 15x40 - Fe 50



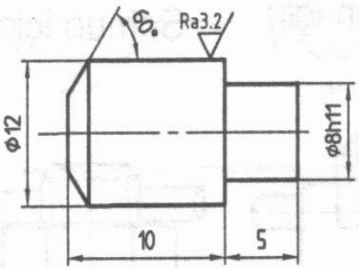
Havşa başlı vidalı perno
TS 69-7A 8x40 - Fe 50



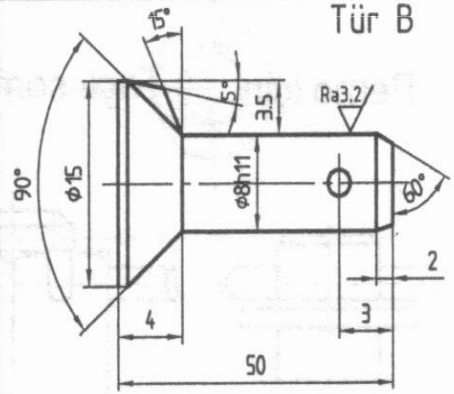
Yassı başlı vidalı perno TS 69-9 20x8x3.6 - Fe50



Yassı başlı perno TS 69-8 8x10 - Fe50



Düz perno
TS 69-11 12x10x5 - Otomat çeliği



Havşa başlı vidalı perno
TS 69-7B 8x40 - Fe 50