

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION R 1684

WIRE, BAR AND TUBE DRAWING DIES
DESIGNATION — MARKING — DIMENSIONS

1st EDITION

July 1970

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BRIEF HISTORY

The ISO Recommendation R 1684, *Wire, bar and tube drawing dies – Designation – Marking – Dimensions*, was drawn up by Technical Committee ISO/TC 29, *Small tools*, the Secretariat of which is held by the Association Française de Normalisation (AFNOR).

Work on this question led to the adoption of Draft ISO Recommendation No. 1684 which was circulated to all the ISO Member Bodies for enquiry in October 1968. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Australia	Israel	Sweden
Czechoslovakia	Italy	Thailand
France	Japan	Turkey
Germany	Netherlands	U.A.R.
Greece	Poland	United Kingdom
Hungary	Portugal	U.S.S.R.
India	South Africa, Rep. of	Yugoslavia
Ireland	Spain	

The following Member Bodies opposed the approval of the Draft :

Austria
Belgium
Switzerland
U.S.A.

This Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided to accept it as an ISO RECOMMENDATION.

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WIRE, BAR AND TUBE DRAWING DIES
DESIGNATION — MARKING — DIMENSIONS

INTRODUCTION

This ISO Recommendation supplements and extends the field of application of ISO Recommendation R 524, *Hard metal wire drawing dies — Interchangeability dimensions of pellets and cases*.

1. SCOPE

This ISO Recommendation relates to wire, bar and tube drawing dies, and gives the main dimensions for a certain number of tool types, together with indications concerning the codified designation of dies and their marking. Details not indicated are left to the discretion of the manufacturers or should be specified in national standards.

This ISO Recommendation may be supplemented later on by the standardization of several special profiles.

This ISO Recommendation includes an Appendix Y comparing bearing and bore dimensions for various types of drawing dies, and an Appendix Z giving a terminology in several languages for characteristic elements of pellets and cases.

2. DESIGNATION

A short designation of an ISO tool is provided in the following order :

2.1 Reference letters of application :

Wire drawing dies for steel	A
Wire drawing dies for non-ferrous metal	B
Bar drawing dies for steel	C
Bar drawing dies for non-ferrous metal	D
Tube drawing dies for steel	E
Tube drawing dies for non-ferrous metal	F
Shaped drawing dies for steel of square and flat section	L
Shaped drawing dies for non-ferrous metal of square and flat section	N
Hexagon bar drawing dies for steel	R
Hexagon bar drawing dies for non-ferrous metal	S

2.2 Reference letters for the shape of the case :

Cylindrical shape	Z
Conical shape	K

2.3 Diameter of pellet d_2 in mm

2.4 Diameter of case d_3 in mm

2.5 Dimensions of bearing or bore

A to F : Diameters of bearing	d_1 in mm
L and N : Boring section	$a \times b$ in mm
R and S : Hexagon size	a in mm

NOTE. — For countries using the inch system of measurement, the converted inch dimensions of clauses 2.3 to 2.5 can be substituted for the metric dimensions in the designation.

2.6 Drawing angle⁽¹⁾ (in degrees) or radius⁽²⁾ (in mm) 2α

2.7 Mark ISO

Examples of codified designations :

AZ 14/28/3.5/16⁽¹⁾ ISO
DK 25/75/9/99/R⁽²⁾ ISO
NZ 45/100/15 $\times$ 15/20 ISO

⁽¹⁾ Where the bore profile is not specified, the user must supply details of the material to be drawn (for example : mild steel up to 0.4 % carbon; copper; aluminium alloys, etc.) together with the method of drawing (for example : dry or wet drawing; push-pointing; floating or fixed mandrels, etc.).

⁽²⁾ To replace the conical surface of the top angle 2α by a toric surface, angle 2α in the designation should be replaced by the symbol "99" accompanied by the radius value, in millimetres, of the generator circle of the toric surface.

3. MARKING

Wire, bar and tube drawings dies conforming to this ISO Recommendation should carry the following details on their cases :

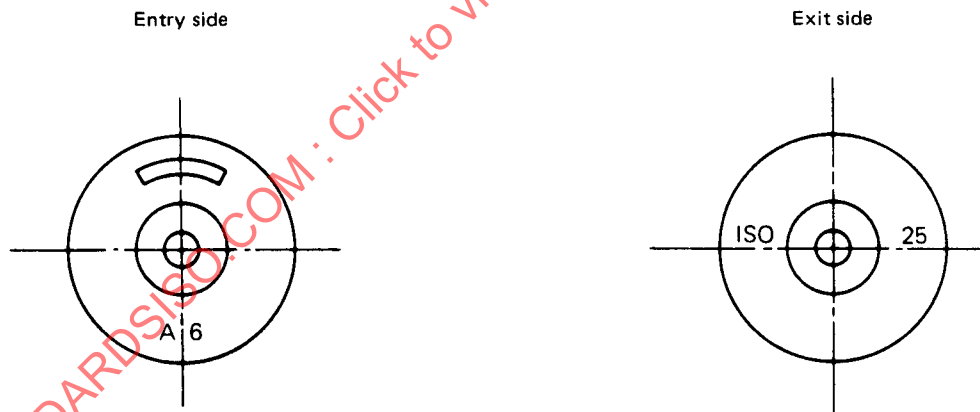
3.1 On the entry side

- manufacturer's trademark
- short designation⁽¹⁾ of the type of bar or wire drawing dies
(Reference letter according to clause 2.1)
- dimensions of bearing or bore according to clause 2.5.

3.2 On the exit side

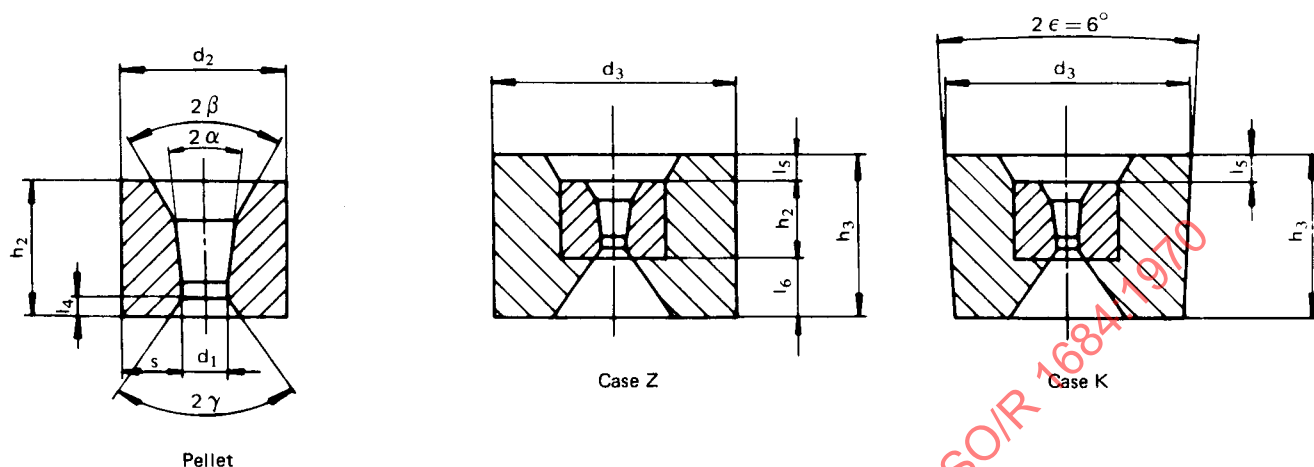
- the mark "ISO"
- the diameter of the pellet d_2

Example :



⁽¹⁾ The short designations can be completed by adding details or special requirements such as the number of the national standard, etc.

4. WIRE DRAWING DIES FOR STEEL (CODE-LETTER A)
AND WIRE DRAWING DIES FOR NON-FERROUS METAL (CODE-LETTER B)



Dimensions in millimetres

Pellet										Case				
d_2	h_2	Form A			Form B			l_4	2β	2γ	d_3	h_3	l_5	$l_6^{(3)}$
		d_1 min.	d_1 max.	$s^{(1)}$ min.	d_1 min.	d_1 max.	$s^{(1)}$ min.							
8	4	0.1	1	3.5	0.1	1.5	3.25	1	90°	90°	28	12	3	5
10	8	0.2	2	4	0.2	2.5	3.75	2				16		
12	10	0.3	3	4.5	0.3	3.5	4.25	2.5				20		
14	12	0.4	4	5	0.4	4.5	4.75	3	60°	75°	28 ⁽²⁾	22	3	7
16	13	0.5	5	5.5	0.5	6	5	3.5			43			
20	17	1.5	6.5	6.75	1.5	6	6	4.5			43	32	5	10
25	20	2.5	9	8	2.5	10.5	7.25	5	53	75 ⁽²⁾				
30	24	3.5	12	9	3.5	13	8.5	6	75					

(1) $s_{\min.} = \frac{d_2 - d_1 \max.}{2}$

(2) The value 28 instead of 43 is more particularly recommended for wire drawing of copper wire.

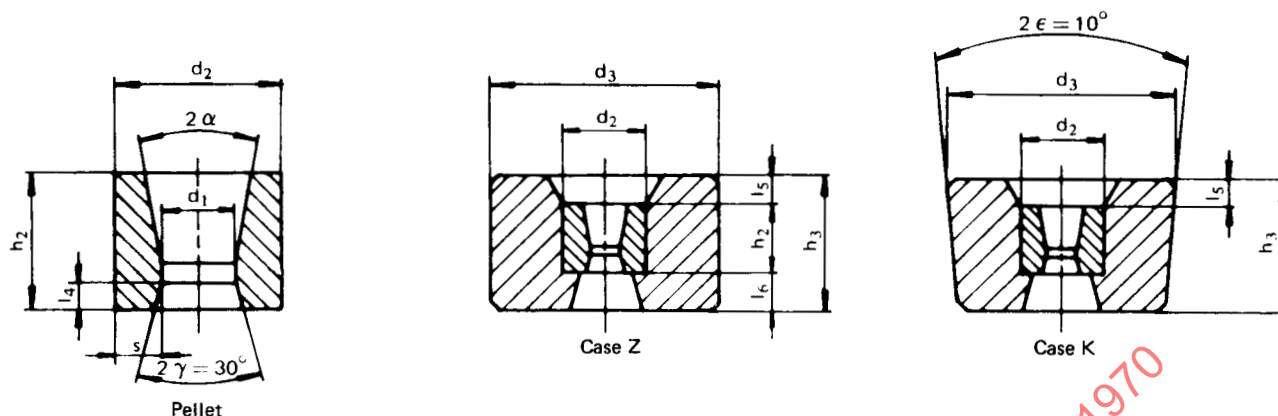
The value 75 instead of 53 is more recommended for wire drawing of steel wires of higher resistance.

(3) Only for information.

NOTES

- $d_1 \min.$ = minimum and preferable diameter of bearing at the first application.
- $d_1 \max.$ = maximum diameter of bearing which is recommended for drawing steel wire having a tensile strength up to 90 hbar in the drawn condition and for drawing wires of non-ferrous metal having a tensile strength up to 60 hbar in the drawn condition.
- The diameter of bearing d_1 required by the user should be chosen within the limits $d_1 \max.$ and $d_1 \min.$
The tolerance of bearing should be specified by the user.
- The case may be of straight (code-letter Z) or tapered form (code-letter K). When a tapered form is required, an included angle of $2\epsilon = 6^\circ$ will be provided, in which event d_3 is the diameter of the larger end of the taper.

5. BAR DRAWING DIES FOR STEEL (CODE-LETTER C)



Dimensions in millimetres

Pellet							Case					
d_2	h_2	d_1		$s^{(1)}$	$l_4^{(2)}$		d_3	h_3	l_5		$l_6^{(3)}$	
		min.	max.	min.	min.	max.			min.	max.	min.	max.
30	24	9	13	8,5	2.4	4.8	100	45	5	9	12	16
35		12	16	9,5								
40		15	19	10,5								
45	25	18	22	11,5	2.5	5.0	100	50	5	9	16	20
50		21	25	12,5			150					
55	27	24	28	13,5	2.7	5.4		55			19	23
60	27	27	31	14,5	2.7	5.4	150	55	5	9	19	23
65		29	34	15,5								
70	30	32	37	16,5	3.0	6.0					60	
75	30	35	41	17,0	3.0	6.0	150	60	5	9	21	25
80		39	45	17,5			200					
85	33	43	49	18,0	3.3	6.6		65			23	27
90	33	47	53	18,5	3.3	6.6	200	65	5	9	23	27
100	35	51	61	19,5	3.5	7.0						

$$(1) s_{\min.} = \frac{d_2 - d_{1 \max.}}{2}$$

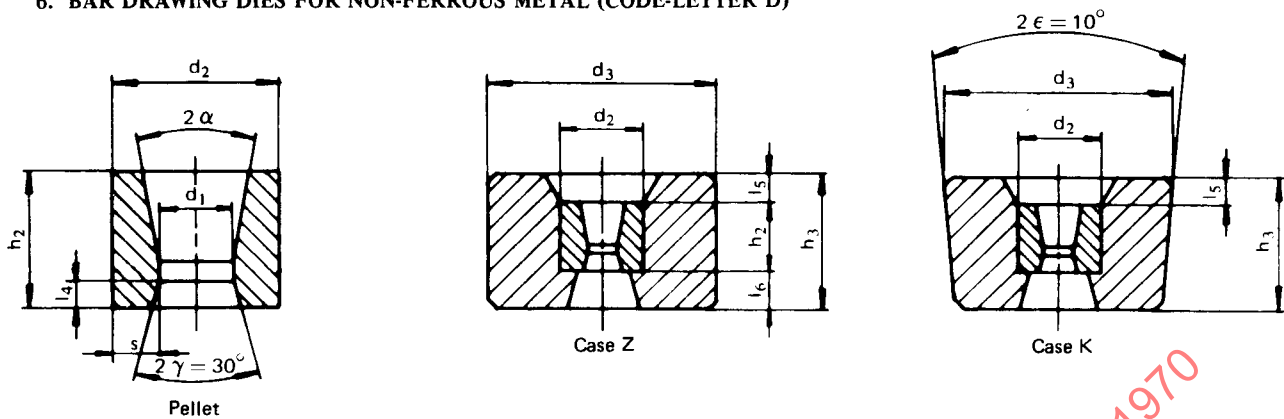
$$(2) l_4 = 0.1 \text{ up to } 0.2 h_2$$

(3) Only for information.

NOTES

- $d_{1 \min.}$ = minimum and preferable diameter of bearing at the first application.
- $d_{1 \max.}$ = maximum diameter of bearing which is recommended for drawing steel bars having a tensile strength up to 90 hbar in the drawn condition with a drawing angle 2α up to and including 20° .
- Dies for drawing steel bars with $d_{1 \max.}$ exceeding 61 mm are outside the scope of this ISO Recommendation.
- The diameters of bearing d_1 required by the user should be chosen within the limits $d_{1 \max.}$ and $d_{1 \min.}$, except when the drawing angle 2α exceeds 20° . The tolerance of bearing should be specified by the user.
- The case may be of straight (code-letter Z) or tapered form (code-letter K). When a tapered form is required, an included angle of $2\epsilon = 10^\circ$ will be provided, in which event d_3 is the diameter of the larger end of the taper.
- For use on multiple draw benches a case diameter d_3 of 125 mm may be supplied for pellet diameters d_2 of 50, 55 and 60 mm and a case diameter d_3 of 175 mm for pellet diameters d_2 of 80 and 85 mm.

6. BAR DRAWING DIES FOR NON-FERROUS METAL (CODE-LETTER D)



Dimensions in millimetres

Pellet							Case							
d_2	h_2	d_1		$s^{(1)}$	$l_4^{(2)}$		d_3	h_3	l_5		$l_6^{(3)}$			
		min.	max.	min.	min.	max.			min.	max.	min.	max.		
25	20	9	12	6.5	2.0	4.0	75	40	5	9	11	15		
30	24	11	14	8.0	2.4	4.8	100	45			12	16		
35		13	18	8.5										
40	24	17	21	9.5	2.4	4.8	100	45	5	9	12	16		
45	25	20	25	10.0	2.5	5.0					150	50	16	20
50		24	28	11.0										
55	27	27	32	11.5	2.7	5.4	150	55	5	9	19	23		
60		30	36	12.0										
65		34	40	12.5										
70	30	38	44	13.0	3.0	6.0	150	60	5	9	21	25		
75		42	48	13.5										
80		46	52	14.0			200							
85	33	50	56	14.5	3.3	6.6	200	65	5	9	23	27		
90		54	60	15.0										
95		58	64	15.5										
100	35	62	68	16.0	3.5	7.0	200	65	5	9	21	25		
105		65	72	16.5			250							

$$(1) s_{\min.} = \frac{d_2 - d_1 \max.}{2}$$

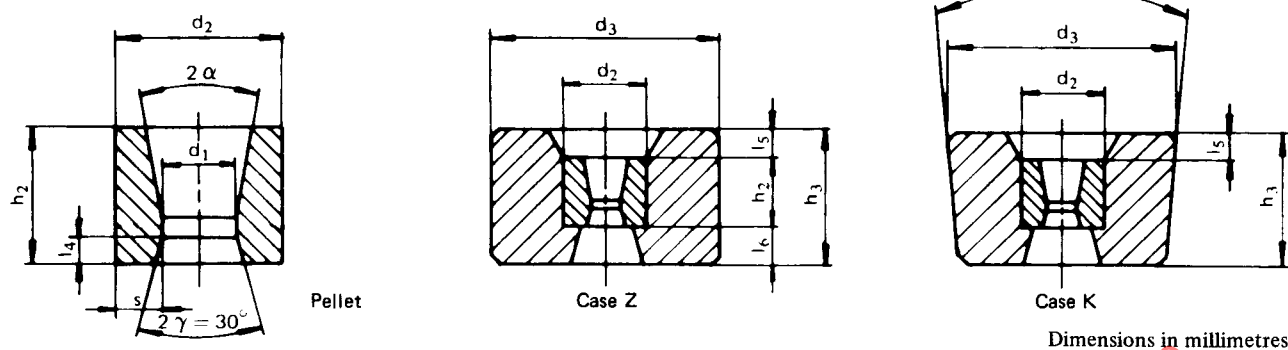
$$(2) l_4 = 0.1 \text{ up to } 0.2 h_2$$

(3) Only for information.

NOTES

- $d_1 \min.$ = minimum and preferable diameter of bearing at the first application.
- $d_1 \max.$ = maximum diameter of bearing which is recommended for drawing non-ferrous metal bars having a tensile strength up to 80 hbar in the drawn condition with a drawing angle 2α up to and including 25° .
- Dies for drawing non-ferrous metal bars with $d_1 \max.$ exceeding 72 mm are outside the scope of this ISO Recommendation.
- The diameter of bearing d_1 required by the user should be chosen within the limits $d_1 \max.$ and $d_1 \min.$ except when the drawing angle 2α exceeds 25° . If the drawing angle is considerably smaller than 25° , the dimension $d_1 \max.$ can be increased by up to 1 mm. The tolerance of bearing should be specified by the user.
- The case may be of straight (code-letter Z) or tapered form (code-letter K). When a tapered form is required, an included angle of $2\epsilon = 10^\circ$ will be provided, in which event d_3 is the diameter of the larger end of the taper.
- For use on multiple draw benches a case diameter d_3 of 125 mm may be supplied for pellet diameters d_2 of 50 and 55 mm and a case diameter d_3 of 175 mm for pellet diameter d_2 of 80 mm.

7. TUBE DRAWING DIES FOR STEEL (CODE-LETTER E)
AND TUBE DRAWING DIES FOR NON-FERROUS METAL (CODE-LETTER F)



Dimensions in millimetres

Pellet							Case													
d_2	h_2	d_1		$s^{(1)}$	$l_4^{(2)}$		d_3	h_3	l_5		$l_6^{(3)}$									
		min.	max.	min.	min.	max.			min.	max.	min.	max.								
25	20	10	12	6.5	2.0	4.0	75	40	5	9	11	15								
30	24	11	14	8.0	2.4	4.8	100	45			12	16								
35		13	18	8.5																
40	24	17	22	9.0	2.4	4.8	100	45	5	9	12	16								
45	25	21	26	9.5	2.5	5.0		50			16	20								
50		24	30	10.0			150													
55	27	28	34	10.5	2.7	5.4	150	55	5	9	19	23								
60		32	38	11.0																
65		36	42	11.5																
70	30	40	45	12.5	3.0	6.0	150	60	5	9	21	25								
75		43	50																	
80		48	55				200													
85	33	53	58	13.5	3.3	6.6	200	65	5	9	23	27								
90		56	62	14.0																
95		60	67																	
100	35	65	70	15.0	3.5	7.0	200	65	5	9	21	25								
105		68	75	250																
110	38	73	78	16.0	3.8	7.6	250	70	5	9	23	27								
120	38	74	88	16.0	3.8	7.6		70			23	27								
130	40	84	97	16.5	4.0	8.0	300	75	5	9	26	30								
140		93	106	17.0																
150		102	115	17.5																

$$(1) s_{\min.} = \frac{d_2 - d_1 \max.}{2}$$

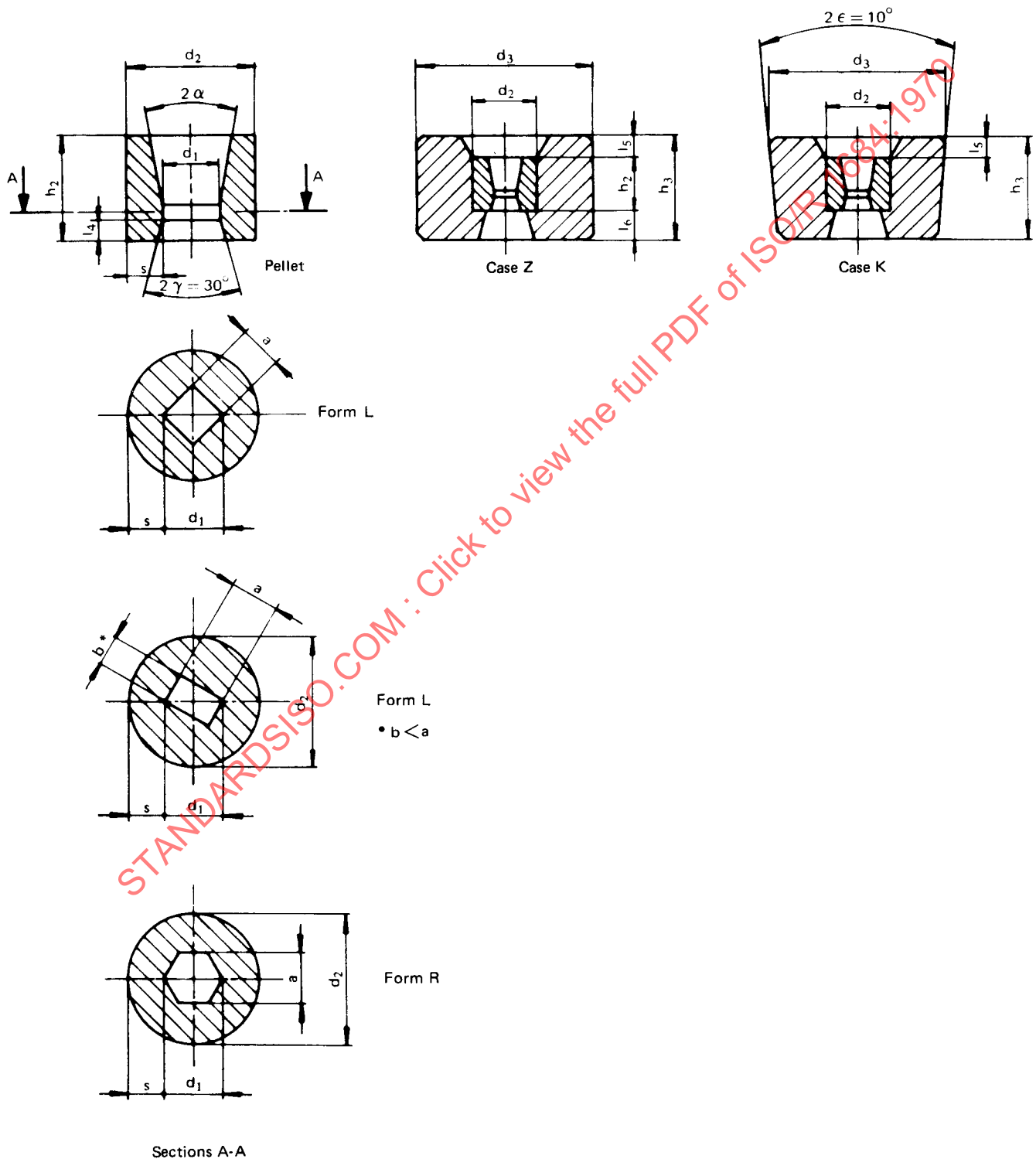
$$(2) l_4 = 0.1 \text{ up to } 0.2 h_2$$

(3) Only for information.

NOTES

1. $d_1 \min.$ = minimum and preferable diameter of bearing at the first application.
2. $d_1 \max.$ = maximum diameter of bearing which is recommended for drawing steel tubes having a tensile strength up to 90 hbar and for drawing non-ferrous tubes having a tensile strength up to 80 hbar in the drawn condition with a drawing angle 2α up to and including 40° .
3. Dies for drawing steel tubes with $d_1 \max.$ exceeding 115 mm are outside the scope of this ISO Recommendation.
4. The diameters of bearing d_1 required by the user should be chosen within the limits $d_1 \min.$ and $d_1 \max.$ except when the drawing angle 2α exceeds 40° . If the drawing angle 2α is considerably smaller than 40° , $d_1 \max.$ may be increased by up to 1 mm. The tolerance of bearing should be specified by the user.
5. The case may be of straight (code-letter Z) or tapered form (code-letter K). When a tapered form is required, an included angle of $2\epsilon = 10^\circ$ will be provided, in which event d_3 is the diameter of the larger end of the taper.
6. For use on multiple draw benches, a case diameter d_3 of 125 mm may be supplied for pellet diameters d_2 of 50, 55, 60 and 65 mm and a case diameter d_3 of 175 mm for pellet diameters d_2 of 80, 85, 90, 95 and 100 mm.

8. SHAPED DRAWING DIES FOR STEEL OF SQUARE AND FLAT SECTION (CODE-LETTER L)
AND HEXAGON BAR DRAWING DIES FOR STEEL (CODE-LETTER R)



Dimensions in millimetres

Pellet										Case					
d_2	h_2	Form L			Form R			$l_4^{(2)}$		d_3	h_3	l_5		$l_6^{(3)}$	
		a min.	a max.	$s^{(1)(3)}$ min.	a min.	a max.	$s^{(1)(3)}$ min.					min.	max.	min.	max.
16	13	1	5	4.45	1	5	5.10	1.3	2.6	43	25	4	—	—	8
20	17	4	6	5.75	4	7	5.95	1.7	3.4		32	5	—	—	10
25	20	5	7	7.50	6	9	7.30	2.0	4.0	75	40	5	9	11	15
30	24	6	9	8.65	8	11	8.65	2.4	4.8	100	45	5	9	12	16
35		8	11	9.70	10	13	10.00								
40		10	13	10.80	12	16	10.75								
45	25	12	15	11.90	15	19	11.55	2.5	5.0	100	50	5	9	16	20
50		14	18	12.25	18	21	12.90			150					
55	27	17	20	13.35	20	24	13.85	2.7	5.4	150	55	5	9	19	23
60	27	19	22	14.45	23	27	14.40	2.7	5.4		55			19	23
65		21	24	15.55	26	29	15.75				150			60	21
70	30	23	27	15.90	28	32	16.55	3.0	6.0	150	60	5	9	21	25
75	30	26	29	17.00	31	35	17.30	3.0	6.0		60			21	25
80		28	31	18.10	34	37	18.65			200	65	23	27		
85	33	30	33	19.15	36	40	19.40	3.3	6.6		200	65	5	9	23
90	33	32	35	20.25	39	43	20.15	3.3	6.6	23					27
100	35	36	40	21.70	42	48	22.30	3.5	7.0					21	25

$$(1) s_{\min.} = \frac{d_2 - d_1 \max.}{2}$$

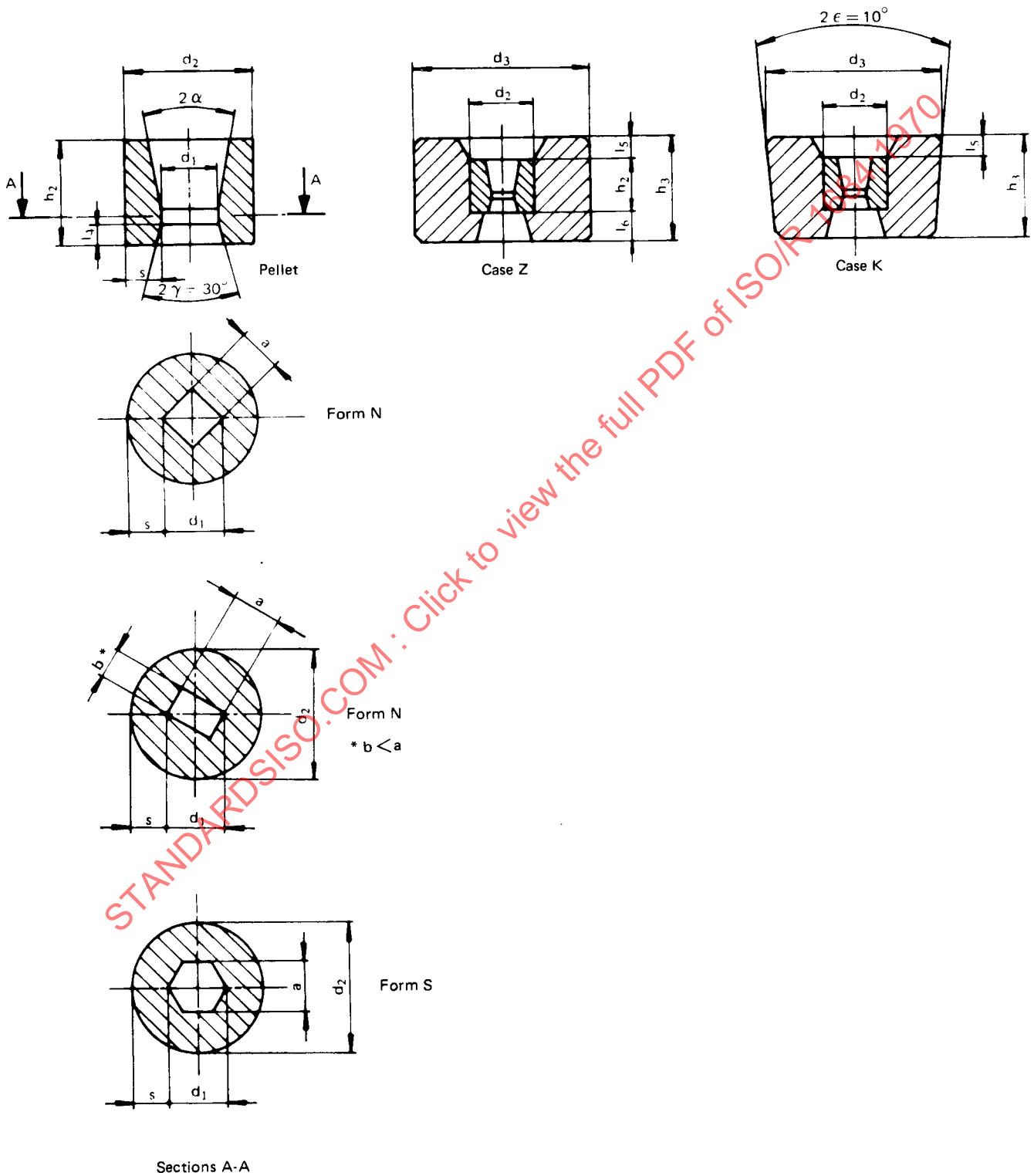
$$(2) l_4 = 0.1 \text{ up to } 0.2 h_2$$

(3) Only for information.

NOTES

1. $a_{\min.}$ = minimum and preferable bore dimension at the first application.
2. $a_{\max.}$ = maximum bore dimension which is recommended for shaped drawing dies for steel of square and flat section and hexagon bar drawing dies for steel having a tensile strength up to 90 hbar in the drawn condition with a drawing angle 2α up to and including 20° .
3. Shaped drawing dies for steel of square and flat section, the dimensions a of which exceed 40 mm, and hexagon bar drawing dies for steel, the dimensions a of which exceed 48 mm, are outside the scope of this ISO Recommendation.
4. The bore dimension a required by the user should be chosen within the limits $a_{\max.}$ and $a_{\min.}$ except when the drawing angle 2α exceeds 20° . The tolerance of bearing should be specified by the user.
5. The case may be of straight (code-letter Z) or tapered form (code-letter K). When a tapered form is required, an included angle of $2\epsilon = 10^\circ$ will be provided, in which event d_3 is the diameter of the larger end of the taper.
6. For use on multiple draw benches, a case diameter d_3 of 125 mm may be supplied for pellet diameters d_2 of 50, 55 and 60 mm and a case diameter d_3 of 175 mm for pellet diameters d_2 of 80 and 85 mm.

9. SHAPED DRAWING DIES FOR NON-FERROUS METAL OF SQUARE AND FLAT SECTION (CODE-LETTER N)
AND HEXAGON BAR DRAWING DIES FOR NON-FERROUS METAL (CODE-LETTER S)



Dimensions in millimetres

Pellet										Case					
d_2	h_2	Form N			Form S			$l_4^{(2)}$		d_3	h_3	l_5		$l_6^{(3)}$	
		a min.	max.	$s^{(1)(3)}$ min.	a min.	max.	$s^{(1)(3)}$ min.					min.	max.	min.	max.
16	13	1	5	4.45	1	5	5.10	1.3	2.6	43	25	4	—	—	8
20	17	4	7	5.05	4	7	5.95	1.7	3.4		32	5	—	—	10
25	20	6	8	6.85	6	10	6.75	2.0	4.0	75	40	5	9	11	15
30	24	7	10	7.95	9	12	8.10	2.4	4.8	100	45	5	9	12	16
35		9	12	9.00	11	15	8.85								
40		11	14	10.10	14	18	9.60								
45	25	13	17	10.50	17	21	10.40	2.5	5.0	100	50	5	9	16	20
50		16	19	11.55	20	24	11.15			150					
55	27	18	22	11.95	23	27	11.90	2.7	5.4	150	55	5	9	19	23
60	27	21	25	12.30	26	31	12.10	2.7	5.4		55			19	23
65		24	28	12.70	29	34	12.90				60				
70	30	27	31	13.10	32	38	13.10	3.0	6.0	150	60	5	9	21	25
75	30	30	33	14.15	36	41	13.85	3.0	6.0						
80		32	36	14.55	39	43	15.15								
85	33	34	38	15.60	41	45	16.50	3.3	6.6	200	65	5	9	23	27
90	33	36	41	16.00	43	48	17.30	3.3	6.6					23	27
100	35	39	45	18.20	46	53	19.40	3.5	7.0	200	65	5	9	21	25

$$(1) s_{\min.} = \frac{d_2 - d_1 \max.}{2}$$

$$(2) l_4 = 0.1 \text{ up to } 0.2 h_2$$

(3) Only for information.

NOTES

1. $a_{\min.}$ = minimum and preferable bore dimension at the first application.
2. $a_{\max.}$ = maximum bore dimension which is recommended for shaped drawing dies for non-ferrous metal of square and flat section and hexagon bar drawing dies for non-ferrous metal having a tensile strength up to 60 hbar in the drawn condition with a drawing angle 2α up to and including 25° .
3. Shaped drawing dies for non-ferrous metal of square and flat section, the dimensions a of which exceed 45 mm, and hexagon bar drawing dies for non-ferrous metal, the dimensions a of which exceed 53 mm, are outside the scope of this ISO Recommendation.
4. The bore dimension a required by the user should be chosen within the limits $a_{\max.}$ and $a_{\min.}$, except where the drawing angle 2α exceeds 25° . The tolerance of bearing should be specified by the user.
5. The case may be of straight (code-letter Z) or tapered form (code-letter K). When a tapered form is required, an included angle of $2\epsilon = 10^\circ$ will be provided, in which event d_3 is the diameter of the larger end of the taper.
6. For use on multiple draw benches a case diameter d_3 of 125 mm can be supplied for pellet diameters d_2 of 50, 55 and 60 mm and a case diameter d_3 of 175 mm for pellet diameters d_2 of 80 and 85 mm.

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