

ASME B5.62M-2016

Hollow Taper Tooling With Flange-Face Contact

AN AMERICAN NATIONAL STANDARD



The American Society of
Mechanical Engineers

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FOREWORD

ASME B5.62M establishes a new American National Standard based on the “Final Report on the Research Project Interface Machine/Tool: Testing and Optimization of Machine Tools,” also known as the “Aachen Reports,” published in March 1994 by the Laboratory for Machine Tools and Production Engineering of the Rheinisch-Westfaelische Technical College, Aachen University, Germany.

This Standard has been created to eliminate confusion caused by different versions and translations of standards for the hollow taper shank, or HSK shank.

The HSK machine tool interface offers an alternative to the standard “steep taper,” with greater stiffness, rigidity, and repeatability than provided by ASME B5.50, CAT-V, and other toolholders with 7/24 tapers.* The ASME B5 Technical Committee 45 felt that, in contrast to existing versions and translations of standards for the HSK, this Standard should contain a more comprehensive interpretation of the Aachen findings, to eliminate confusion arising from the blend of existing HSK documentation. This Standard provides the user with a comprehensive selection of options and includes supplemental information.

ASME B5.62M-2016 was approved by the American National Standards Institute on August 22, 2016.

* Final Report on Research Project — Study on Design Possibilities for the Connection Machine/Tool, August 15, 1991, page 4

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Machine Tools — Components, Elements, Performance, and Equipment

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NOTE: The Committee would like to thank C. Koehn, Air Gaging, LLC, for his contributions to this Standard.

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- | | |
|-------------------------|---|
| Subject: | Cite the applicable paragraph number(s) and the topic of the inquiry in one or two words. |
| Edition: | Cite the applicable edition of the Standard for which the interpretation is being requested. |
| Question: | Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. Please provide a condensed and precise question, composed in such a way that a "yes" or "no" reply is acceptable. |
| Proposed Reply(ies): | Provide a proposed reply(ies) in the form of "Yes" or "No," with explanation as needed. If entering replies to more than one question, please number the questions and replies. |
| Background Information: | Provide the Committee with any background information that will assist the Committee in understanding the inquiry. The Inquirer may also include any plans or drawings that are necessary to explain the question; however, they should not contain proprietary names or information. |

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Part 1

HSK Shanks

1-1 GENERAL

1-1.1 Scope

This Standard covers basic toolholder shanks with a hollow 1/9.98 taper, and simultaneous contact face and taper mating surfaces that are applicable to a range of machine tool applications. Hollow taper shank (HSK shank) Forms A, B, C, D, E, F, and T with nominal flange diameters of 25 mm to 160 mm are covered by this Standard.

1-1.2 Interchangeability

Machine tool interfaces conforming to this Standard are interchangeable with machine tool interfaces conforming to DIN 69893-1:2003, DIN 69893-2:2003, DIN 69893-5:2004, DIN 69893-6:2003, ISO 12164-1:2001, ISO 12164-2:2001, ISO 12164-3:2008, and ISO 12164-4:2008.

1-1.3 Forms

The HSK machine tool interfaces as manufactured in the seven basic shank forms (see [Figure 1-1.3-1](#)), and as customized by selection of several optional features, are suitable for use in a wide range of machine tool applications. The seven basic shank forms are as follows:

(a) *Form A.* Form A is the preferred design for use on machine tools with automatic tool changers. Keyways are located at the small end of the tool taper. Form A includes provision for through-tool coolant and manual tool change. See [Figure 1-1.3-1](#), illustration (a).

(b) *Form B.* Like Form A, Form B is for use on machine tools with automatic tool changers, but it has a reduced taper compared to Form A. Keyways are located on the flange. Form B includes provision for through-flange coolant and manual tool change. See [Figure 1-1.3-1](#), illustration (b).

(c) *Form C.* Form C is similar to Form A but is intended for use on machine tools requiring manual tool change. Tools with Form C shanks are typically used on transfer lines, or as part of a modular tooling system. See [Figure 1-1.3-1](#), illustration (c).

(d) *Form D.* Form D is similar to Form B but is intended for use on machine tools requiring manual tool change. See [Figure 1-1.3-1](#), illustration (d).

(e) *Form E.* Form E is similar to Form A, but it does not have keyways or orientation features. Form E is intended for high-speed machining. See [Figure 1-1.3-1](#), illustration (e).

(f) *Form F.* Form F is similar to Form E but has a reduced taper size. Form F is intended for high-speed machining. See [Figure 1-1.3-1](#), illustration (f).

(g) *Form T.* Form T is similar to Form A but has modifications to accommodate use with stationary tools. See [Figure 1-1.3-1](#), illustration (g).

1-1.4 Definitions

balance: the condition in which the mass centerline and rotational centerline of a rotor are coincident.

clamp set: a mechanical device for securing a shank in the receiver.

data chip: a radio-frequency identification device.

drive key: a feature of a machine tool intended to orient the toolholder in the receiver and assist in delivery of the driving torque from the spindle nose to the tool.

keyway: the part of a machine tool that receives the drive key.

receiver: the spindle or nonrotating socket of a machine.

shank: a unit that fits directly into the spindle or nonrotating socket of a machine.

spindle: component assembly of the machine tool, the function of which is to accept the basic toolholder shank.

spindle nose: that part of a spindle into which the shank is accepted.

1-1.5 Figure Interpretation

The [Part 1](#) figures are illustrated and labeled in accordance with ASME Y14.5.

1-2 FORMS A AND C

Form A includes provisions for automatic tool change, a data chip, an orientation notch, an access hole for manual clamping, drive keyways, and through-spindle coolant supply via coolant tube. Form C is intended for manual tool change and includes an access hole for manual clamping, drive keyways, and through-spindle coolant supply.

Figures 1-2-1 and 1-2-2 and Table 1-2-1 show the geometry and dimensions of HSK Forms A and C.

1-3 FORMS B AND D

Forms B and D include provisions for a data chip, an orientation notch, an access hole for manual clamping, drive keyways, and through-spindle coolant supply.

Figures 1-3-1 and 1-3-2 and Table 1-3-1 show the geometry and dimensions of HSK Forms B and D.

1-4 FORM E

Form E includes provisions for through-spindle coolant supply and automatic tool change. Form E does not include provisions for a data chip, an orientation notch, an access hole for manual clamping, or drive keyways.

Figure 1-4-1 and Table 1-4-1 show the geometry and dimensions of HSK Form E.

1-5 FORM F

Form F includes provisions for through-spindle coolant supply and automatic tool change. Form F does not include provisions for a data chip, an orientation notch, an access hole for manual clamping, or drive keyways.

Figure 1-5-1 and Table 1-5-1 show the geometry and dimensions of HSK Form F.

1-6 FORM T

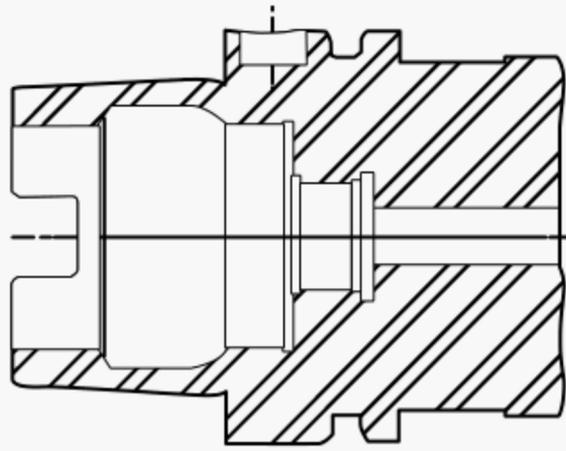
Form T includes provisions for automatic tool change, a data chip, an orientation notch, an access hole for manual clamping, drive keyways, and through-spindle coolant supply via coolant tube.

Figure 1-6-1 and Table 1-6-1 show the geometry and dimensions of HSK Form T.

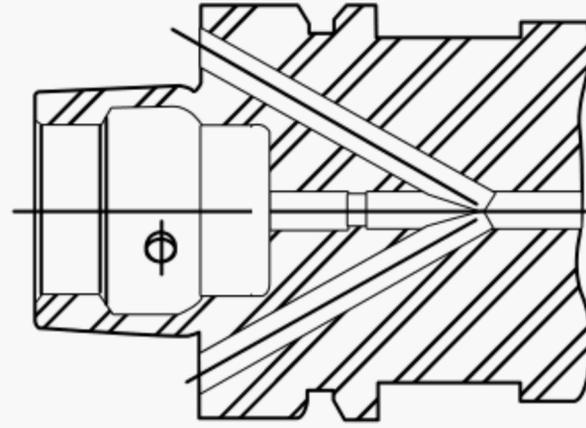
1-7 IDENTIFICATION CODING

Figure 1-7-1 shows the identification coding format for HSK shanks. As shown in Table 1-7-1, not all possible combinations of nominal size and feature are allowed per this Standard.

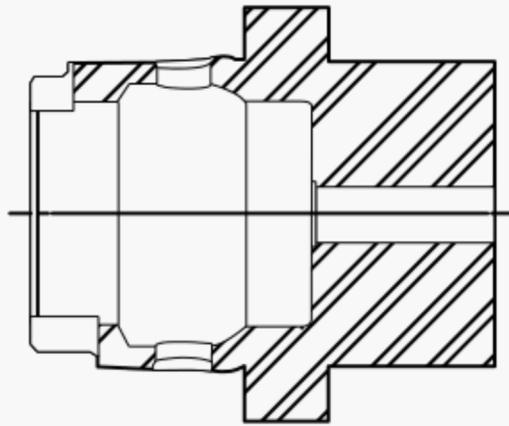
Figure 1-1.3-1 Basic HSK Shank Forms



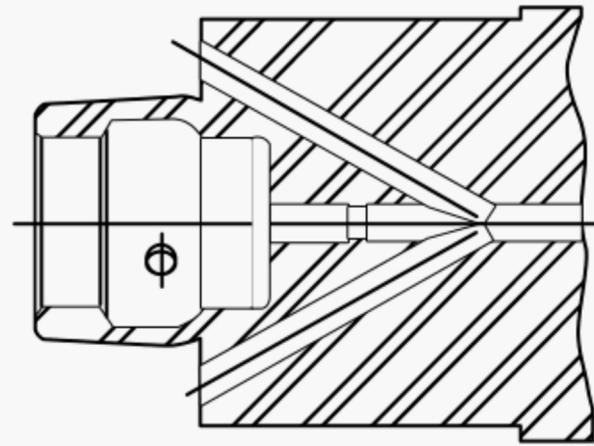
(a) Form A



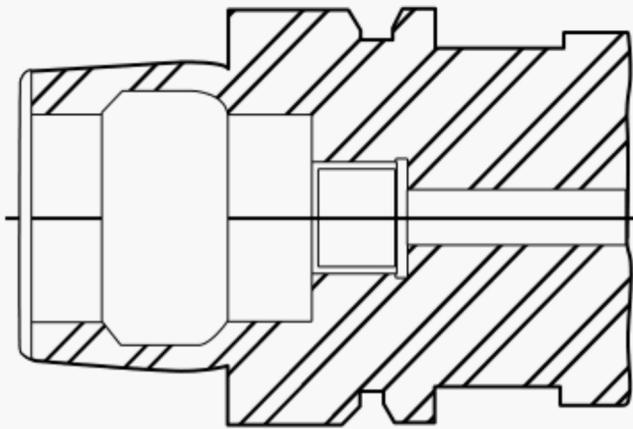
(b) Form B



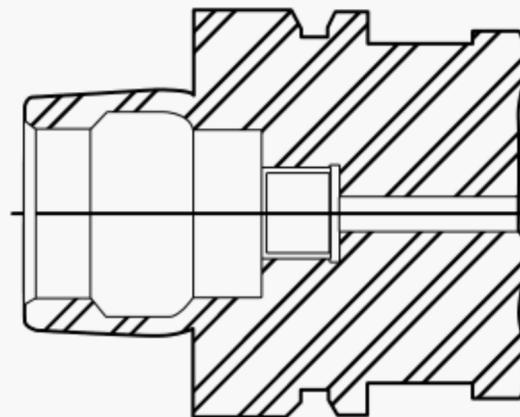
(c) Form C



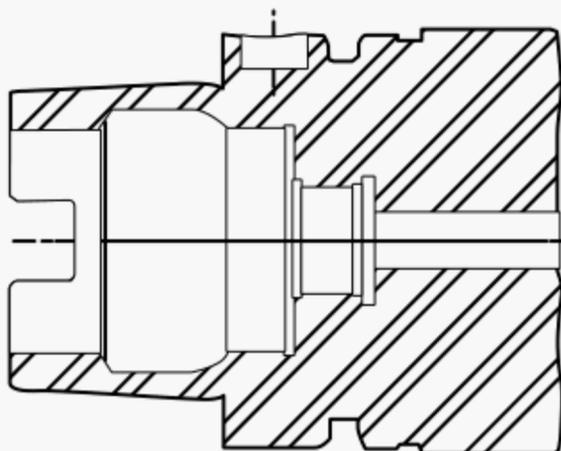
(d) Form D



(e) Form E

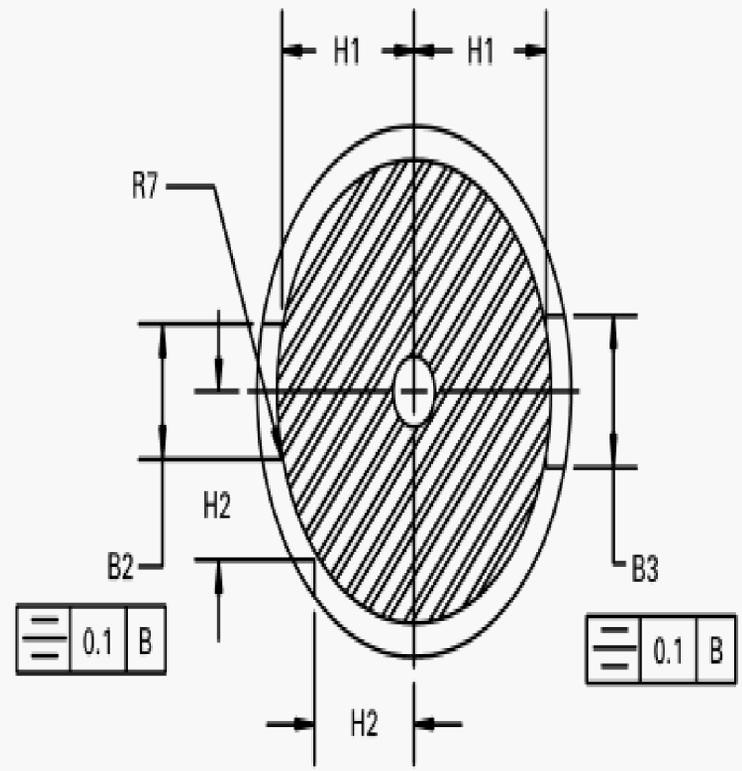
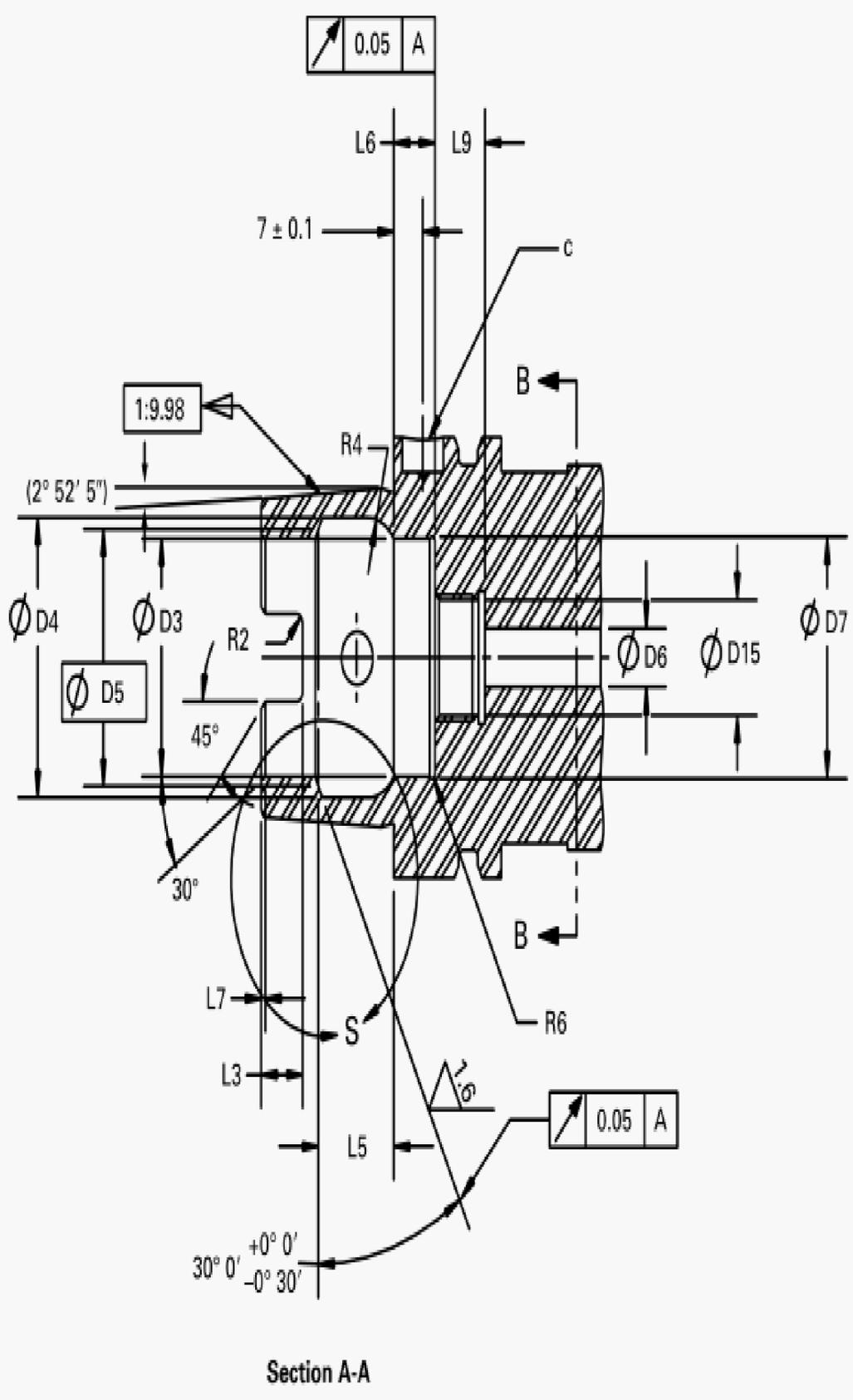


(f) Form F

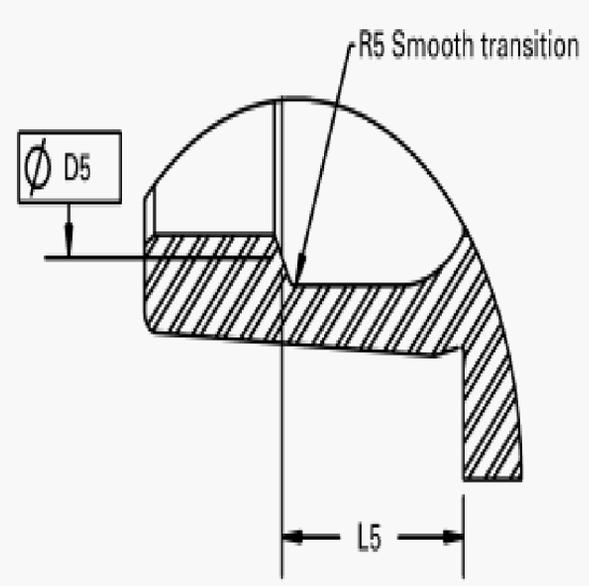


(g) Form T

Figure 1-2-1 HSK Form A (Cont'd)

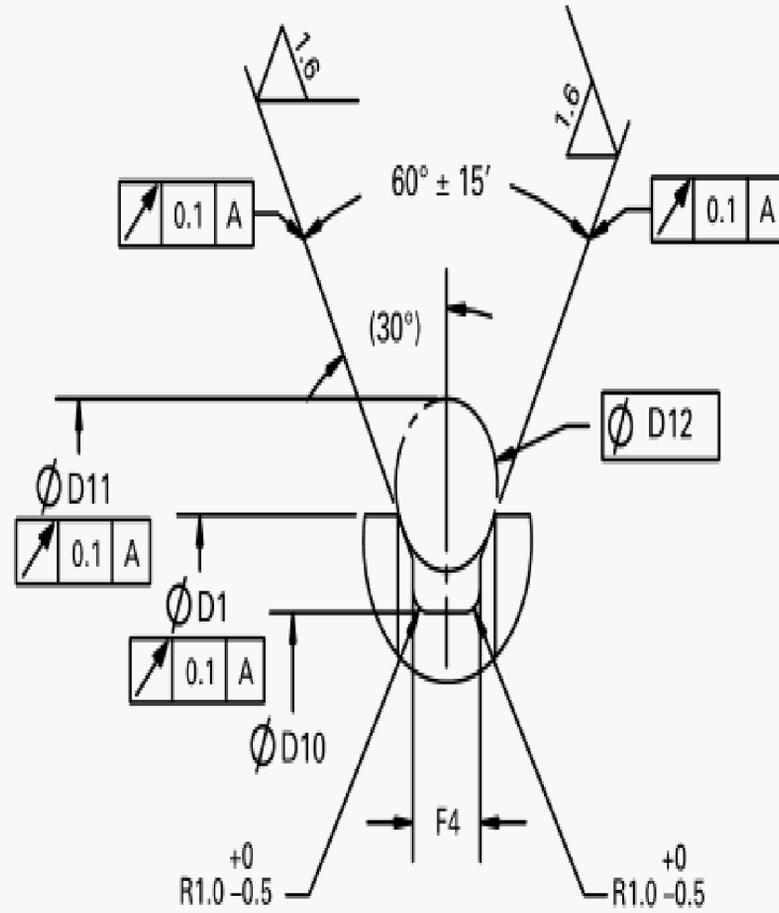


Section B-B

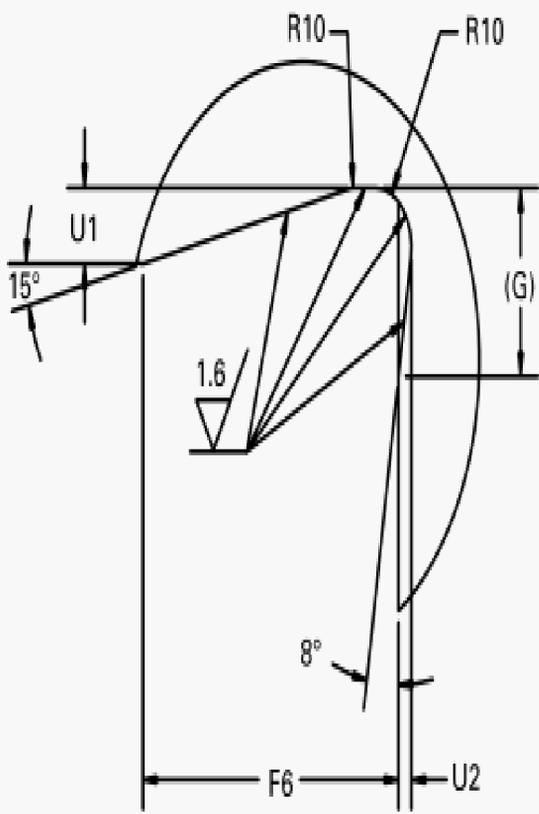


Detail S

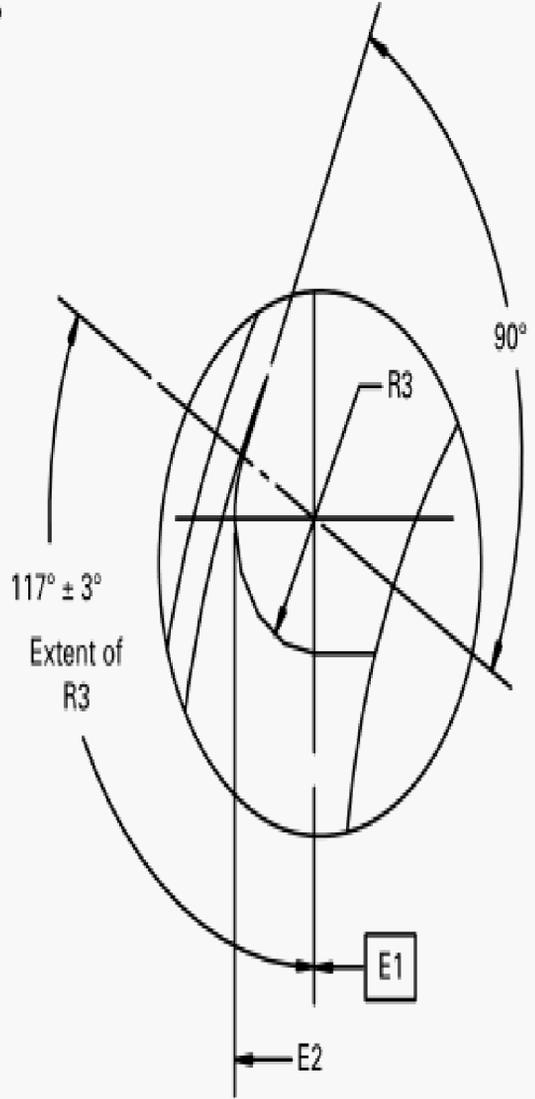
Figure 1-2-1 HSK Form A (Cont'd)



Detail X
(Form A)



Detail (R)



Detail Y

Figure 1-2-1 HSK Form A (Cont'd)

LEGEND:

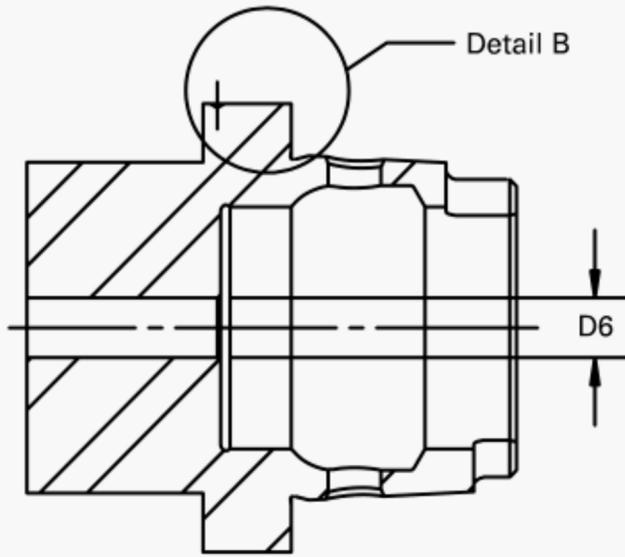
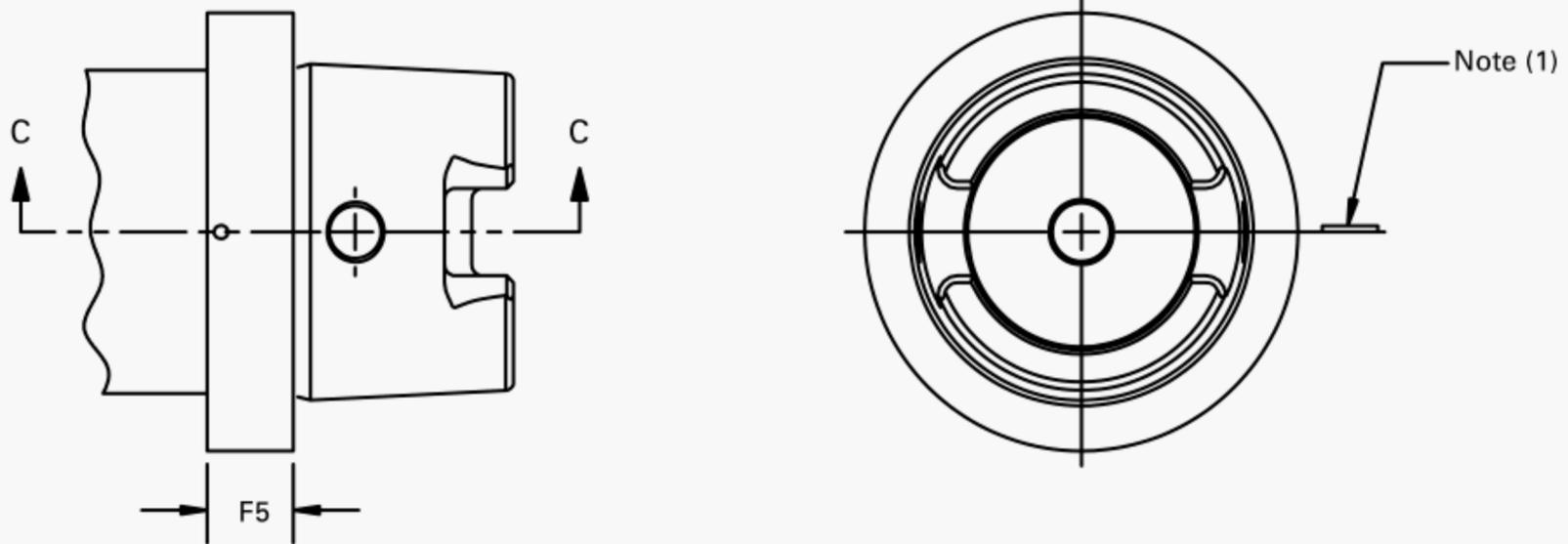
- a = corner break 0.2 mm to 0.5 mm
- b = chamfer $0.3 \times 45^\circ$ optional
- c = provision for data chip (Form A only)

GENERAL NOTES:

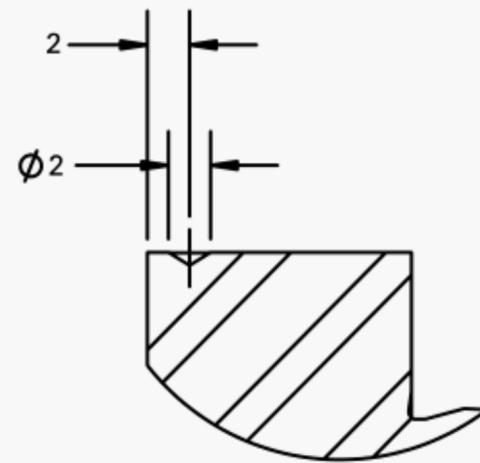
- (a) See [Table 1-2-1](#) for dimension values.
- (b) Surface texture is per ASME B46.1. Unless otherwise specified, surface texture, R_a , is $3.2 \mu\text{m}$.
- (c) Break all sharp edges.

NOTE: (1) Cutting-edge orientation (right-hand orientation) shown.

Figure 1-2-2 HSK Form C



Section C-C



Detail B [Note (2)]

GENERAL NOTES:

- (a) See [Table 1-2-1](#) for dimension values.
- (b) For dimensions not indicated on the figure, refer to [Figure 1-2-1](#).

NOTES:

- (1) Cutting-edge orientation (right-hand orientation) shown.
- (2) Drill spot as shown (Form C only).

Table 1-2-1 Dimensions for HSK Forms A and C

Dimension	Tolerance	Nominal Size							
		32	40	50	63	80	100	125	160
B1	+0.04 -0.04	7.05	8.05	10.54	12.54	16.04	20.02	25.02	30.02
B2	H10 [Note (1)]	7	9	12	16	18	20	25	32
B3	H10 [Note (1)]	9	11	14	18	20	22	28	36
D1	H10 [Note (1)]	32	40	50	63	80	100	125	160
D2	...	24.007	30.007	38.009	48.010	60.012	75.013	95.016	120.016
D3	H10 [Note (1)]	17	21	26	34	42	53	67	85
D4	H11 [Note (1)]	20.5	25.5	32	40	50	63	80	100
D5	...	19	23	29	37	46	58	73	92
D6	Max.	4.2	5	6.8	8.4	10.2	12	14	16
D7 [Note (2)]	+0 -0.1	17.4	21.8	26.6	34.5	42.5	53.8	...	...
D8	±0.1	4	4.6	6	...	...	...	...	...
	±0.2	...	...	...	7.5	8.5	12	...	...
D9	Max.	26	34	42	53	68	88	111	144
D10	+0 -0.1	26.5	34.8	43	55	70	92	117	152
D11	+0 -0.1	37	45	59.3	72.3	88.8	109.75	134.75	169.75
D12	...	4	4	7	7	7	7	7	7
D15	...	M10 × 1	M12 × 1	M16 × 1	M18 × 1	M20 × 1.5	M24 × 1.5	M30 × 1.5	M35 × 1.5
E1	...	8.82	11	13.88	17.99	21.94	27.37	35.37	44.32
E2	+0 -0.05	10.20	12.88	16.26	20.87	25.82	32.25	41.25	52.20
F1	+0 -0.1	20	20	26	26	26	29	29	31
F2	Min.	35	35	42	42	42	45	45	47
F3	+0.1 -0.1	16	16	18	18	18	20	20	22
F4	+0.15 -0	2	2	3.75	3.75	3.75	3.75	3.75	3.75
F5	...	10	10	12.5	12.5	16	16	...	...
F6	+0.2 -0	1	2	2	2	2.5	2.5	4	4
(G)	...	0.9	1.1	1.4	1.4	1.8	1.8	3.1	3.1
H1	+0 -0.2	13	17	21	26.5	34	44	55.5	72
H2	+0 -0.3	9.5	12	15.5	20	25	31.5	39.5	50
H3	+0.2 -0	5.4	5.2	5.1	5	4.9	4.9	4.8	4.8
L1	+0 -0.2	16	20	25	32	40	50	63	80
L2	...	3.2	4	5	6.3	8	10	12.5	16
L3	+0.2 -0	5	6	7.5	10	12	15	19	23
L4	+0.2 -0	3	3.5	4.5	6	8	10	12	16
L5	JS10	8.92	11.42	14.13	18.13	22.85	28.56	36.27	45.98

Table 1-2-1 Dimensions for HSK Forms A and C (Cont'd)

Dimension	Tolerance	Nominal Size							
		32	40	50	63	80	100	125	160
L6	+0 -0.1	8	8	10	10	12.5	12.5	16	16
L7	+0.3 -0	0.8	0.8	1	1	1.5	1.5	2	2
L8	+0.1 -0.1	5	6	7.5	9	12	15	...	...
L9	+0 -0.3	6	8	10	12	14	16	18	20
L12	±0.2	12	12	19	21	22	24	24	24
R1	±0.1	0.6	0.8	1	1.2	1.6	2	2.5	3.2
R2	+0 -0.2	1	1	1.5	1.5	2	2	2.5	2.5
R3 [Note (3)]	+0.05 -0.05	1.38	1.88	2.38	2.88	3.88	4.88	5.88	7.88
R4	±0.1 ±0.2	4 ...	5 ...	6 ...	... 8	... 10	... 12	... 16	... 20
R5	±0.1	0.4	0.4	0.5	0.6	0.8	1	1.2	1.6
R6 [Note (2)]	±0.1	0.5	1	1.5	1.5	2	2	...	...
R7	Max.	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
R9 [Note (4)]	±0.1 ±0.2	3.5 ...	4.5 ...	6 ...	... 8	... 9	... 10	5 ...	5 ...
R10	±0.1	0.2	0.4	0.6	0.6	1	1	1.6	1.6
T	...	0.002	0.002	0.0025	0.003	0.004	0.004	0.005	0.005
U1	+0.1 -0	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.3
U2	+0.05 -0	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2
O-ring [Note (2)]	...	16 × 1	18.77 × 1.78	21.89 × 2.62	29.82 × 2.62	36.09 × 3.53	47.6 × 3.53	...	...

GENERAL NOTES:

- (a) All dimensions are in millimeters.
 (b) Unless otherwise specified, angular dimensional tolerance shall be ±0.5 deg.
 (c) Unless otherwise specified, linear dimensional tolerance shall be ±0.2 mm.

NOTES:

- (1) Tolerance designations are per ASME B4.2.
 (2) For use with certain proprietary clamp sets (not supplied with standard tooling).
 (3) R3 is tangent to B1.
 (4) R9 applies to B2 and B3.

Figure 1-3-1 HSK Form B

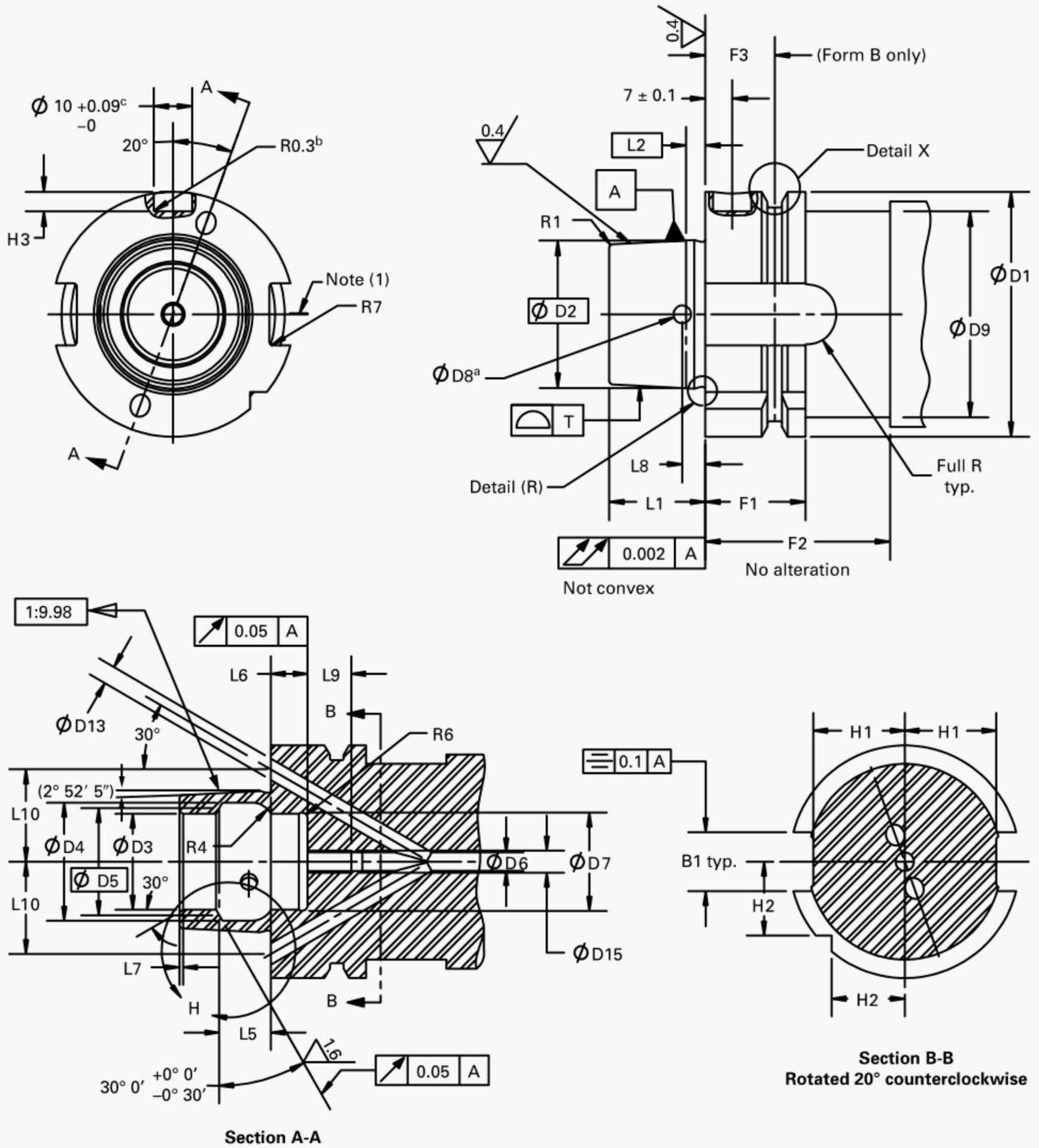
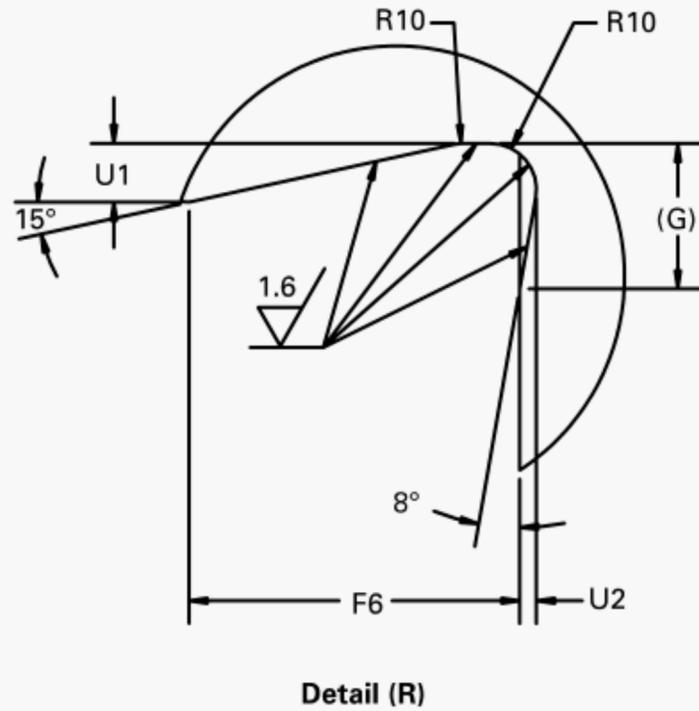
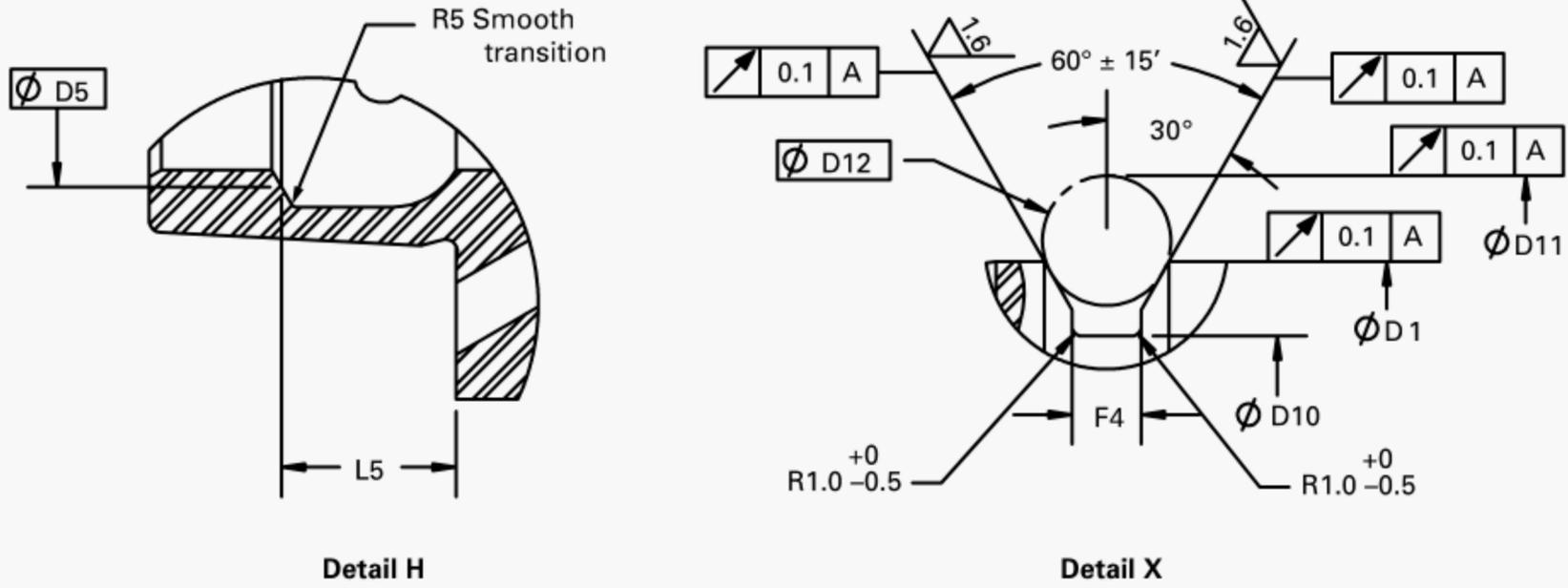


Figure 1-3-1 HSK Form B (Cont'd)



LEGEND:

- a = corner break 0.2 mm to 0.5 mm
- b = chamfer 0.3 × 45° optional
- c = provision for data chip

GENERAL NOTES:

- (a) See Table 1-3-1 for dimension values.
- (b) Surface texture is per ASME B46.1. Unless otherwise specified, surface texture, R_a , is 3.2 μm .
- (c) Break all sharp edges.

NOTE: (1) Cutting-edge orientation (right-hand orientation) shown.

Figure 1-3-2 HSK Form D

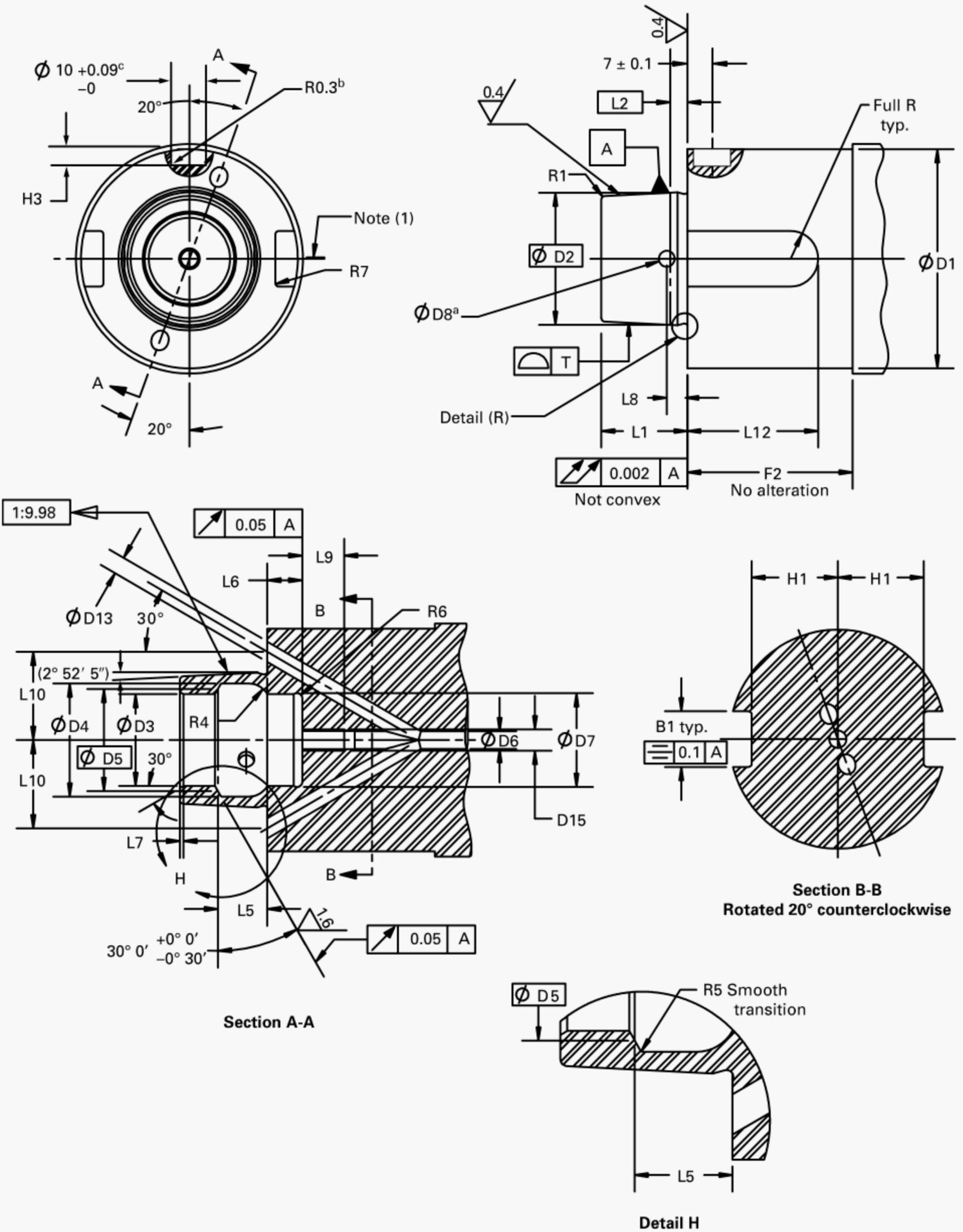


Figure 1-3-2 HSK Form D (Cont'd)

LEGEND:

a = corner break 0.2 mm to 0.5 mm

b = chamfer 0.3 × 45° optional

c = provision for data chip

GENERAL NOTES:

(a) See [Table 1-3-1](#) for dimension values.

(b) For dimensions not indicated on the figure and for Detail (R), refer to [Figure 1-3-1](#).

(c) Surface texture is per ASME B46.1. Unless otherwise specified, surface texture, R_a , is 3.2 μm.

(d) Break all sharp edges.

NOTE: (1) Cutting-edge orientation (right-hand orientation) shown.

Table 1-3-1 Dimensions for HSK Forms B and D

Dimension	Tolerance	Nominal Size						
		40	50	63	80	100	125	160
B1	H8	10	12	16	18	20	25	32
D1	H10 [Note (1)]	40	50	63	80	100	125	160
D2	...	24.007	30.007	38.009	48.010	60.012	75.013	95.016
D3	H10 [Note (1)]	17	21	26	34	42	53	67
D4	H11 [Note (1)]	20.5	25.5	32	40	50	63	80
D5	...	19	23	29	37	46	58	73
D6	Max.	4.2	5	6.8	8.4	10.2	12	14
D7 [Note (2)]	-0.1	17.4	21.8	26.6	34.5	42.5	53.8	...
D8	±0.1	4	4.6	6	...	...	...	...
	±0.2	...	...	...	7.5	8.5	12	...
D9	Max.	34	42	53	68	88	111	144
D10	-0.1	34.8	43	55	70	92	117	152
D11	+0	45	59.3	72.3	88.8	109.75	134.75	169.75
	-0.1							
D12	...	4	7	7	7	7	7	7
D13	...	3	3.5	5	6	7	8.5	10
D15	...	M5	M6	M8	M10	M12	M14	M16
F1	+0	20	26	26	26	29	29	31
	-0.1							
F2	Min.	35	42	42	42	45	45	47
F3	+0.1	16	18	18	18	20	20	22
	-0.1							
F4	+0.15	2	3.75	3.75	3.75	3.75	3.75	3.75
	-0							
F6	+0.2	2	2	2	2.5	2.5	4	4
	-0							
(G)	...	1.1	1.4	1.4	1.8	1.8	3.1	3.1
H1	+0	16	20	25	31.5	40	50	62.5
	-0.4							
H2	+0	12	15.5	20	25	31.5	39.5	50
	-0.3							
H3	+0.3	5.2	5.1	5	4.9	4.9	4.8	4.8
	-0							
L1	+0	16	20	25	32	40	50	63
	-0.2							
L2	...	3.2	4	5	6.3	8	10	12.5
L5	JS10	8.92	11.42	14.13	18.13	22.85	28.56	36.27
L6	+0	8	8	10	10	12.5	12.5	16
	-0.1							
L7	+0.3	0.8	0.8	1	1	1.5	1.5	2
	-0							
L8	±0.1	5	6	7.5	9	12	15	...
L9	Min.	8	9	12	15	18	18	18
L10	-0.1	16	20	25	32	40	50	63
L12	±0.2	25	32	34	35	39	41.5	47
R1	±0.1	0.6	0.8	1	1.2	1.6	2	2.5
R2	±0.1	4	5	6	...	...	...	...
	±0.2	...	...	...	8	10	12	16
R3	±0.1	0.4	0.4	0.5	0.6	0.8	1	1.2
R4	±0.1	5	6	...	...	...	...	...
	±0.2	...	...	8	9	10	12.5	16
R5	±0.1	1	1	1	1	2	2	2

Table 1-3-1 Dimensions for HSK Forms B and D (Cont'd)

Dimension	Tolerance	Nominal Size						
		40	50	63	80	100	125	160
R6 [Note (2)]	±0.1	0.5	1	1.5	1.5	2	2	...
R10	±0.1	0.2	0.4	0.6	0.6	1	1	1.6
T	...	0.002	0.002	0.0025	0.003	0.004	0.004	0.005
U1	+0.1 -0	0.2	0.2	0.2	0.2	0.2	0.3	0.3
U2	+0.05 -0	0.1	0.1	0.1	0.1	0.1	0.2	0.2
O-ring [Note (2)]	...	16 × 1	18.77 × 1.78	21.89 × 2.62	29.82 × 2.62	36.09 × 3.53	47.6 × 3.53	...

GENERAL NOTES:

- (a) All dimensions are in millimeters.
 (b) Unless otherwise specified, angular dimensional tolerance shall be ±0.5 deg.
 (c) Unless otherwise specified, linear dimensional tolerance shall be ±0.2 mm.

NOTES:

- (1) Tolerance designations are per ASME B4.2.
 (2) For use with certain proprietary clamp sets (not supplied with standard tooling).

Figure 1-4-1 HSK Form E

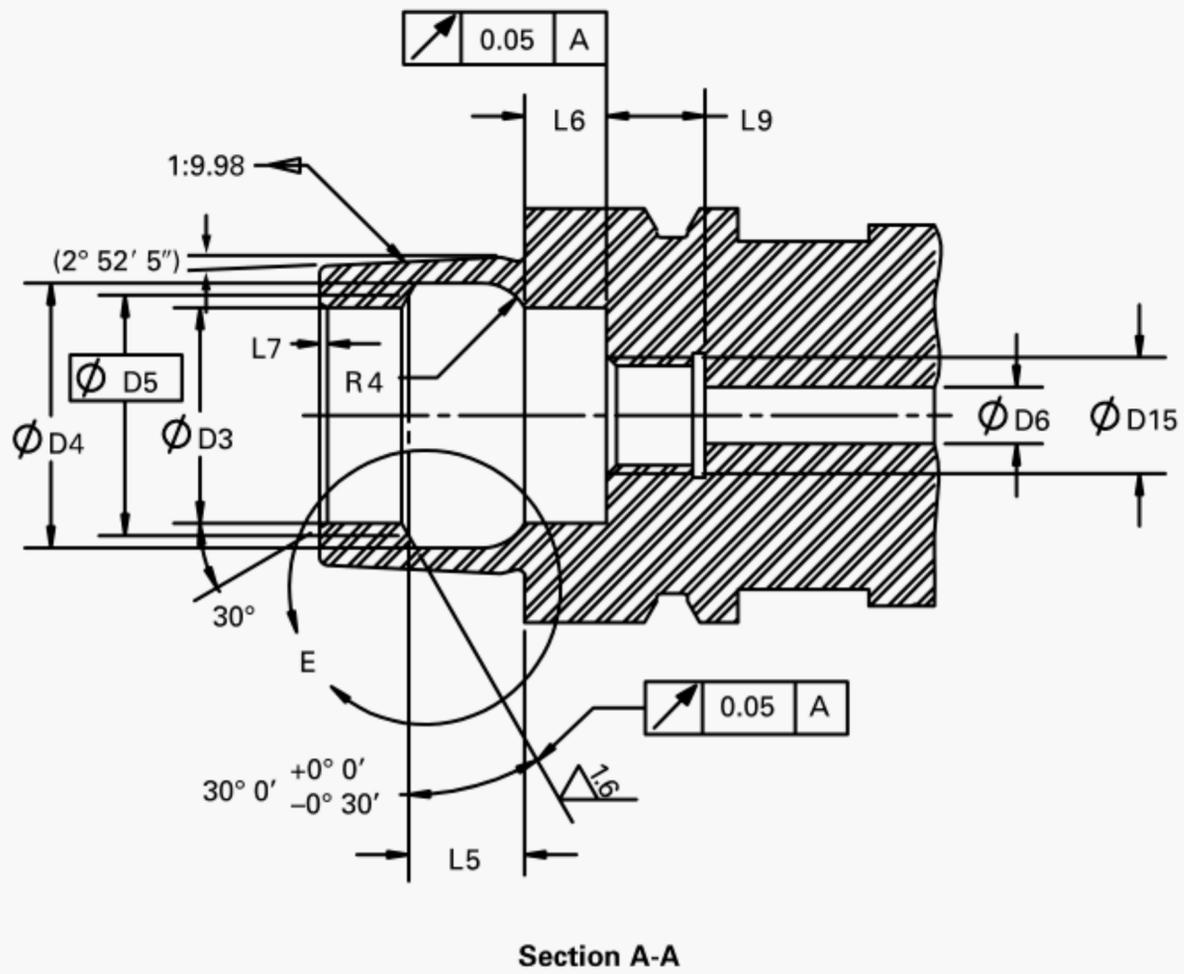
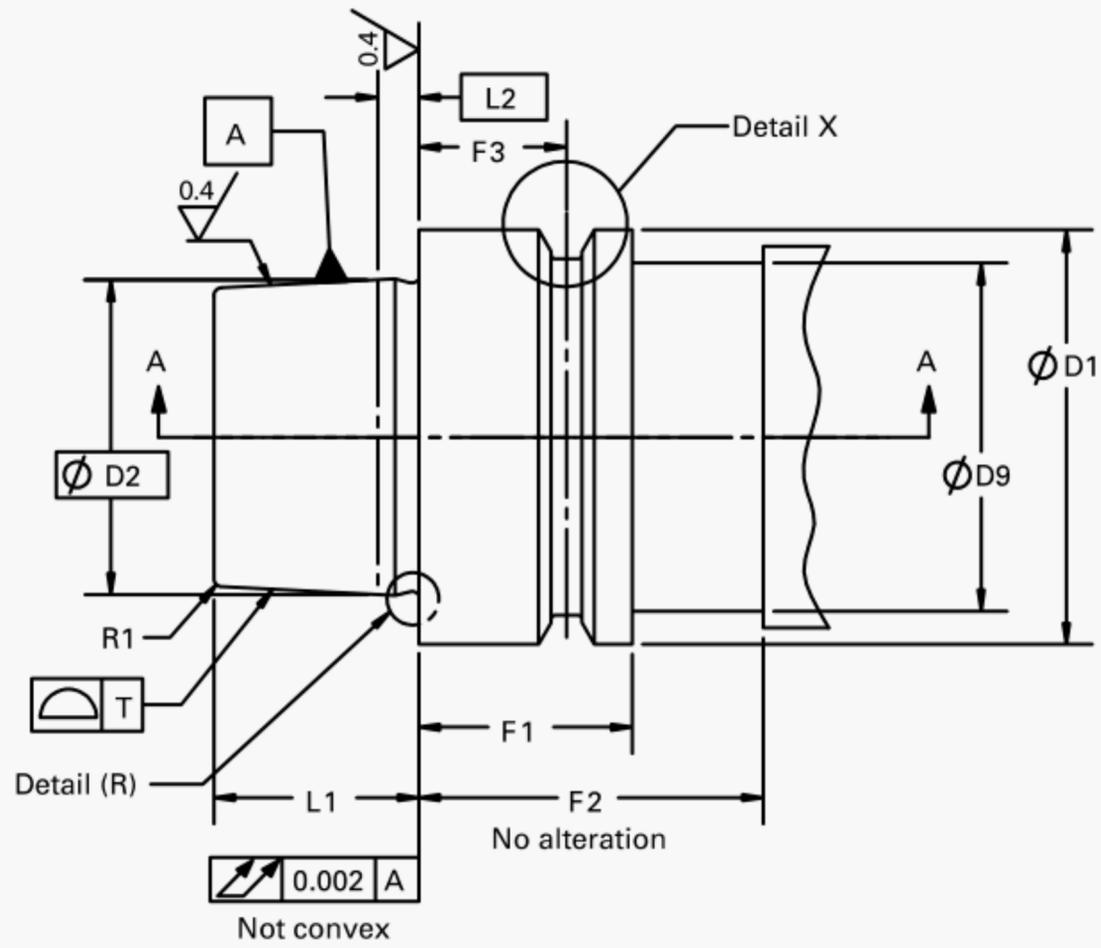
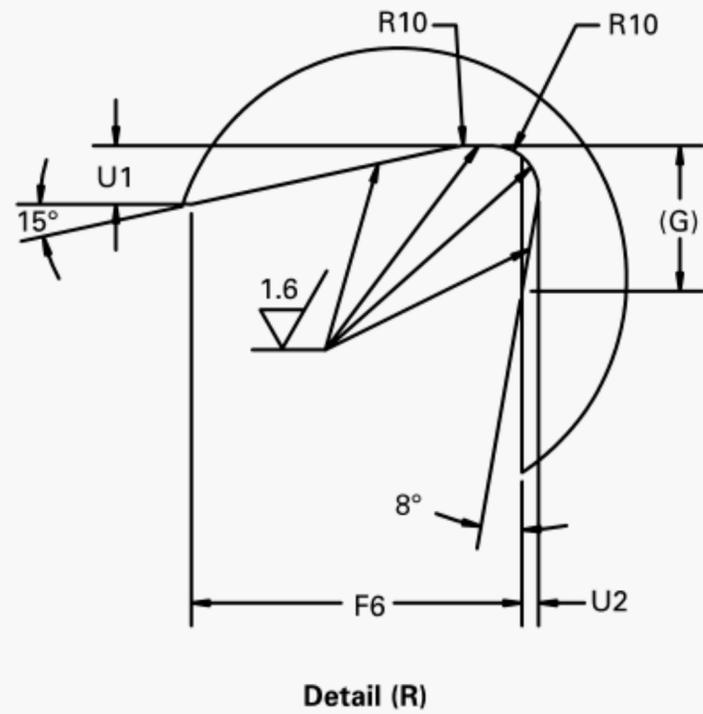
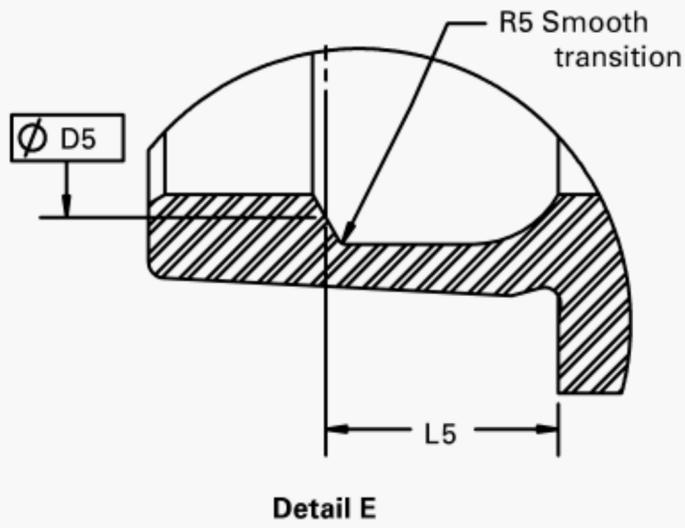
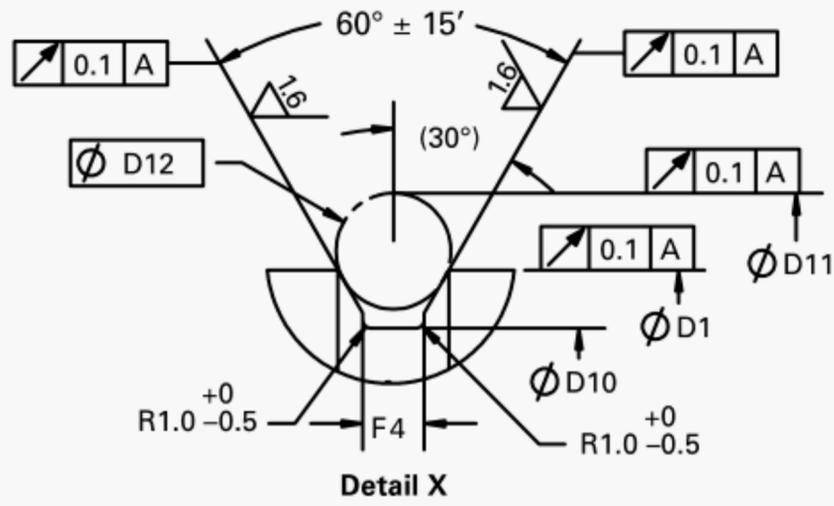


Figure 1-4-1 HSK Form E (Cont'd)



GENERAL NOTES:

- (a) See Table 1-4-1 for dimension values.
- (b) Surface texture is per ASME B46.1. Unless otherwise specified, surface texture, R_a , is 3.2 μm .
- (c) Break all sharp edges.

Table 1-4-1 Dimensions for HSK Form E

Dimension	Tolerance	Nominal Size						
		25	32	40	50	63	80	100
D1	H10 [Note (1)]	25	32	40	50	63	80	100
D2	...	19.006	24.007	30.007	38.009	48.010	60.012	75.013
D3	H10 [Note (1)]	14	17	21	26	34	42	53
D4	H11 [Note (1)]	16.4	20.5	25.5	32	40	50	63
D5	...	15	19	23	29	37	46	58
D6	Max.	3	4.2	5	6.8	8.4	10.2	12
D9	Max.	20	26	34	42	53	68	88
D10	+0 -0.1	22	26.5	34.8	43	55	70	92
D11	+0 -0.1	28.5	37	45	59.3	72.3	88.8	109.75
D12	...	3	4	4	7	7	7	7
D15	...	M8 × 1	M10 × 1	M12 × 1	M16 × 1	M18 × 1	M20 × 1.5	M24 × 1.5
F1	-0.1	10	20	20	26	26	26	29
F2	Min.	20	35	35	42	42	42	45
F3	±0.1	4.5	16	16	18	18	18	20
F4	+0.15	2	2	2	3.75	3.75	3.75	3.75
F6	+0.2 -0	1	1	2	2	2	2.5	2.5
(G)	...	0.9	0.9	1.1	1.4	1.4	1.8	1.8
L1	-0.2	13	16	20	25	32	40	50
L2	...	2.5	3.2	4	5	6.3	8	10
L5	JS10	7.21	8.92	11.42	14.13	18.13	22.85	28.56
L6	+0 -0.1	6	8	8	10	10	12.5	12.5
L7	+0.3	0.6	0.8	0.8	1	1	1.5	1.5
L9	-0.3	5	6	8	10	12	14	16
R1	±0.1	0.5	0.6	0.8	1	1.2	1.6	2
R4	±0.1 ±0.2	3 ...	4 ...	5 ...	6 ...	... 8	... 10	... 12
R5	±0.1	0.3	0.4	0.4	0.5	0.6	0.8	1
R10	±0.1	0.2	0.2	0.4	0.6	0.6	1	1
T	...	0.002	0.002	0.002	0.0025	0.003	0.004	0.004
U1	+0.1 -0	0.1	0.1	0.2	0.2	0.2	0.2	0.2
U2	+0.05 -0	0.1	0.1	0.1	0.1	0.1	0.1	0.1

GENERAL NOTES:

- (a) All dimensions are in millimeters.
 (b) Unless otherwise specified, angular dimensional tolerance shall be ±0.5 deg.
 (c) Unless otherwise specified, linear dimensional tolerance shall be ±0.2 mm.

NOTE: (1) Tolerance designations are per ASME B4.2.

Figure 1-5-1 HSK Form F

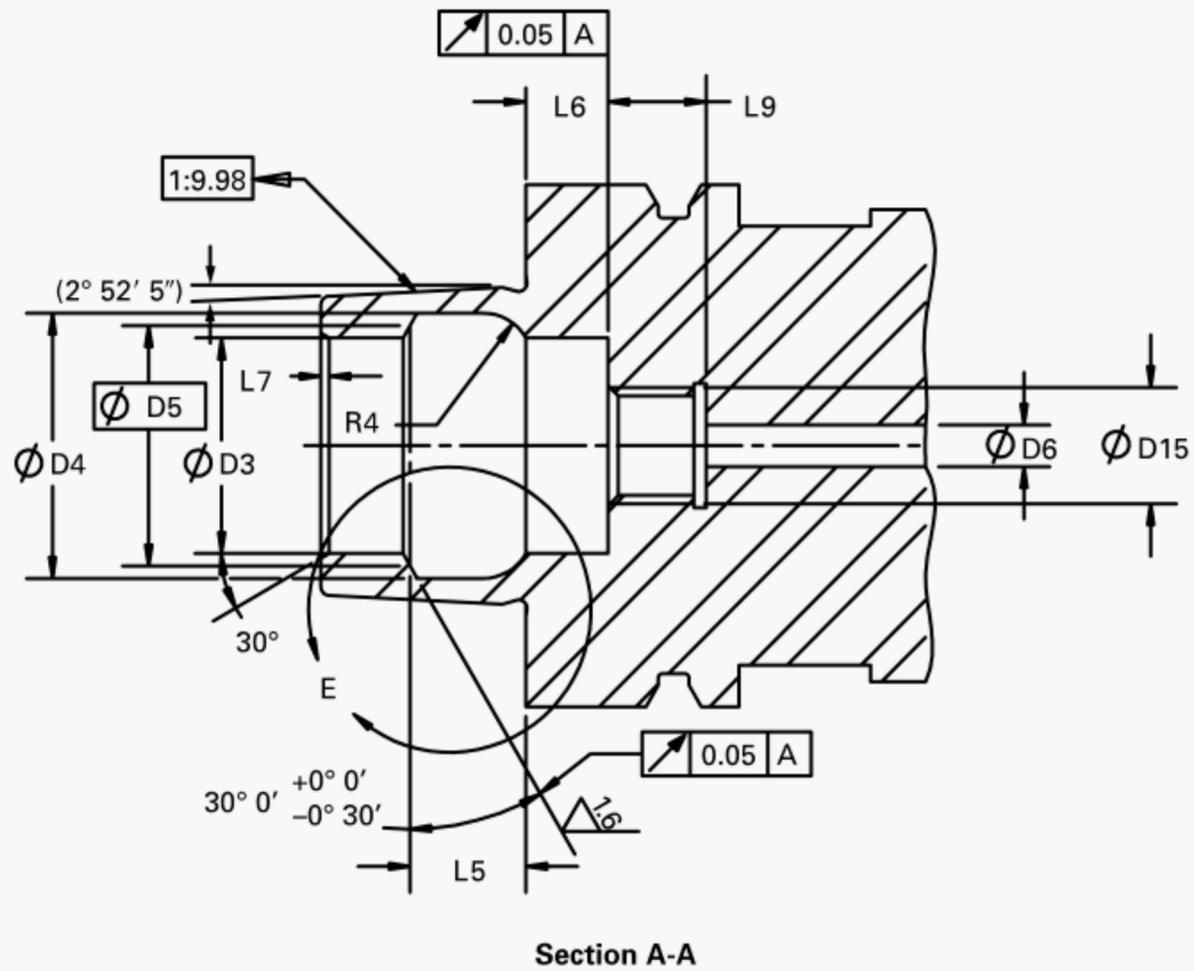
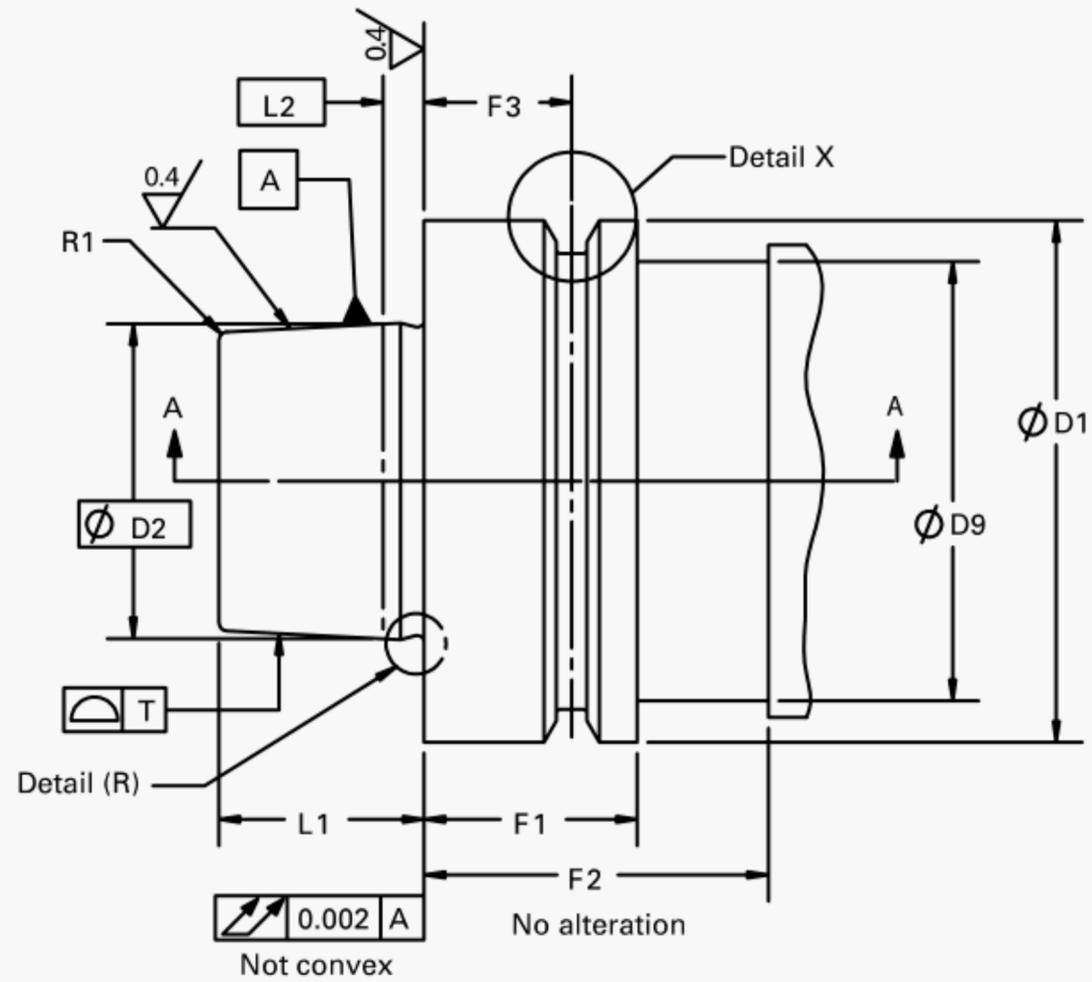


Table 1-5-1 Dimensions for HSK Form F

Dimension	Tolerance	Nominal Size		
		50	63	80
D1	H10 [Note (1)]	50	63	80
D2	...	30.007	38.009	48.010
D3	H10 [Note (1)]	21	26	34
D4	H11 [Note (1)]	25.5	32	40
D5	...	23	29	37
D6	Max.	5	6.8	8.4
D9	Max.	42	53	68
D10	-0.1	43	55	70
D11	-0.1	59.3	72.3	88.8
D12	...	7	7	7
D15	...	M12 × 1	M16 × 1	M18 × 1
F1	+0 -0.1	26	26	26
F2	Min.	42	42	42
F3	±0.1	18	18	18
F4	+0.15 -0	3.75	3.75	3.75
F6	+0.2	2	2	2
(G)	...	1.4	1.4	1.8
L1	+0 -0.2	20	25	32
L2	...	4	5	6.3
L5	JS10 [Note (1)]	11.42	14.13	18.13
L6	-0.1	8	10	10
L7	+0.3 -0	0.8	1	1
L9	-0.3	8	10	12
R1	±0.1	0.8	1	1.2
R4	±0.1 ±0.2	5 ...	6 ...	... 8
R5	±0.1	0.4	0.5	0.6
R10	±0.1	0.4	0.6	0.6
T	...	0.002	0.0025	0.003
U1	+0.1	0.2	0.2	0.2
U2	+0.05	0.1	0.1	0.1

GENERAL NOTES:

- (a) All dimensions are in millimeters.
 (b) Unless otherwise specified, angular dimensional tolerance shall be ±0.5 deg.
 (c) Unless otherwise specified, linear dimensional tolerance shall be ±0.2 mm.

NOTE: (1) Tolerance designations are per ASME B4.2.

Figure 1-6-1 HSK Form T

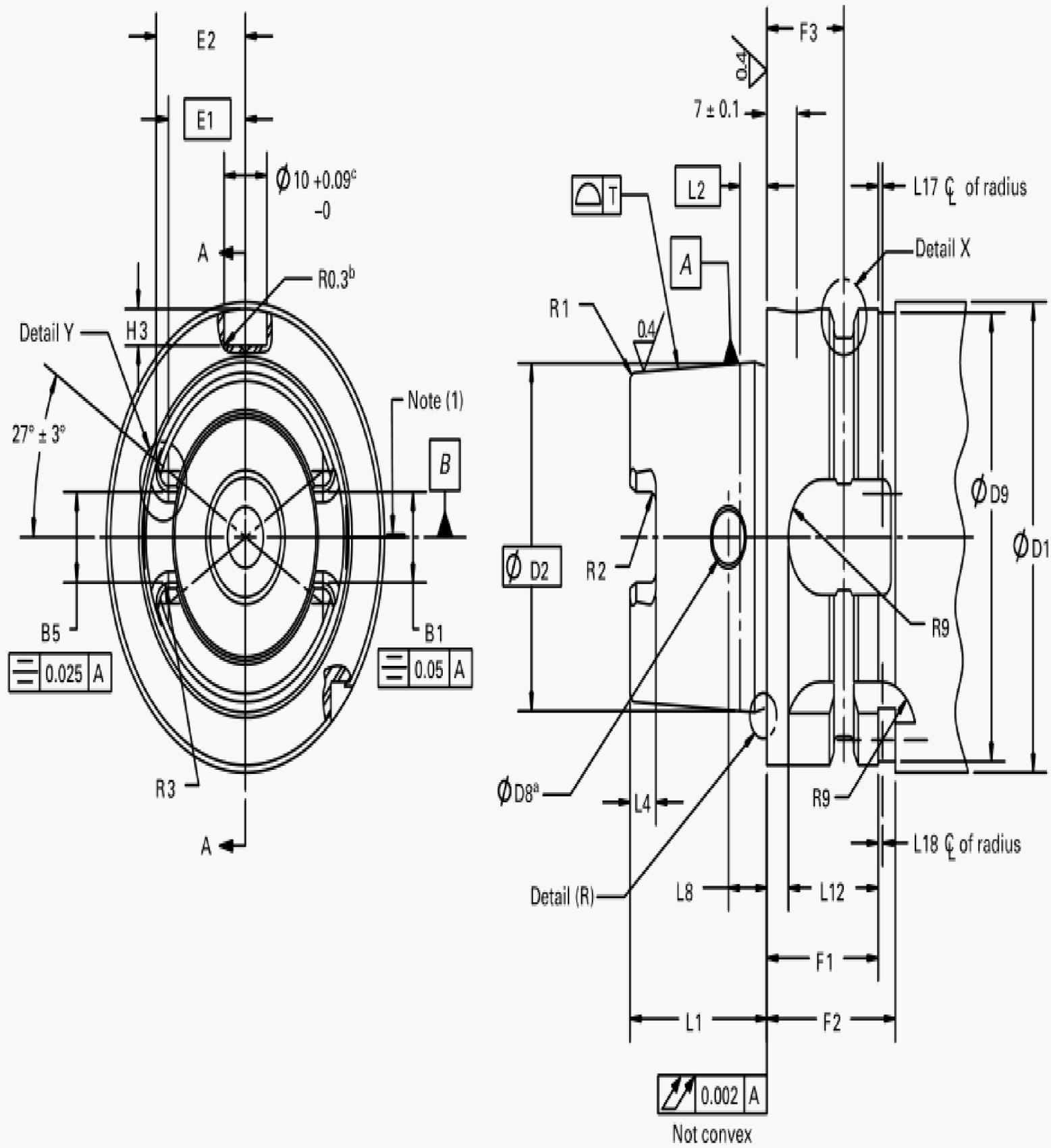


Figure 1-6-1 HSK Form T (Cont'd)

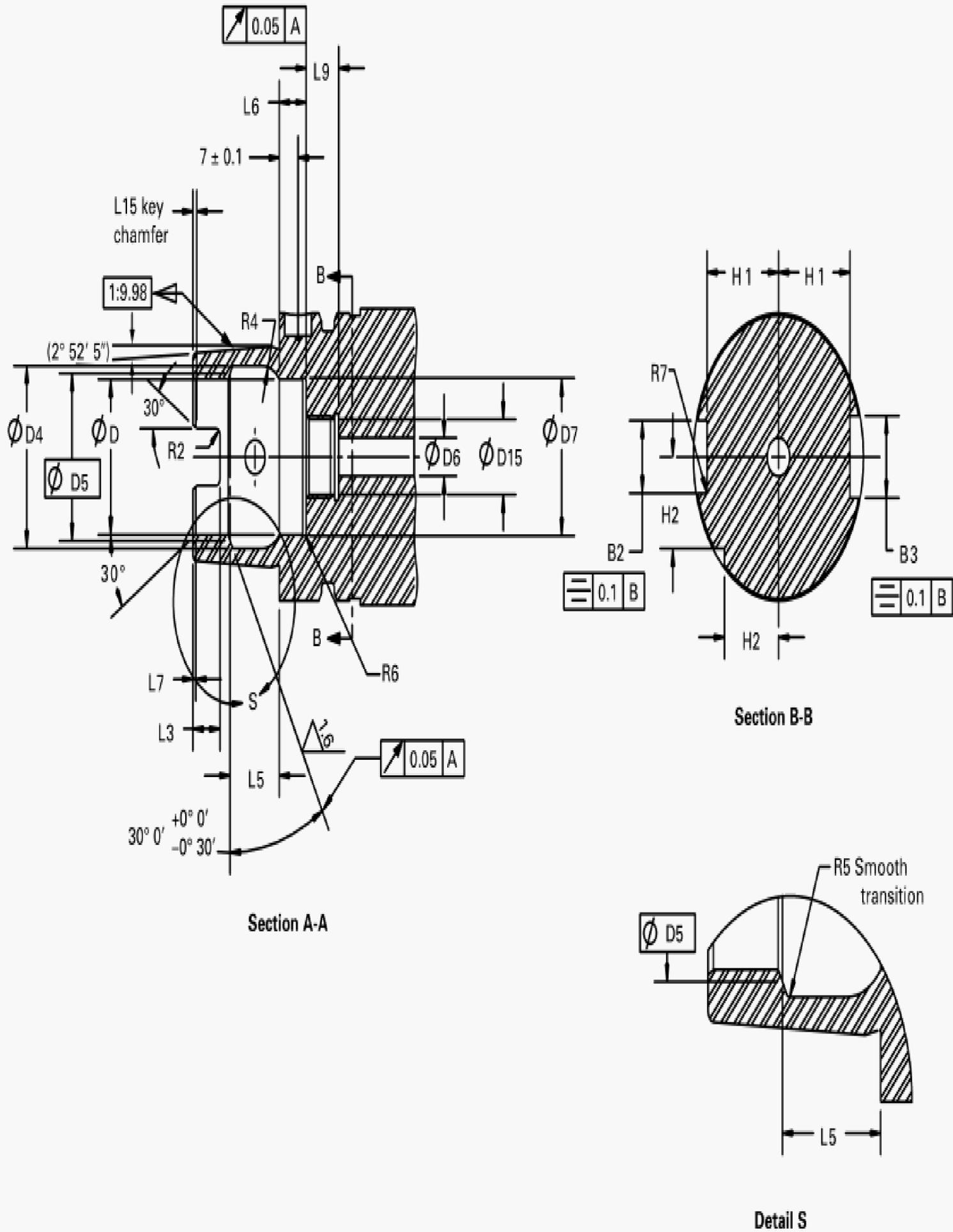
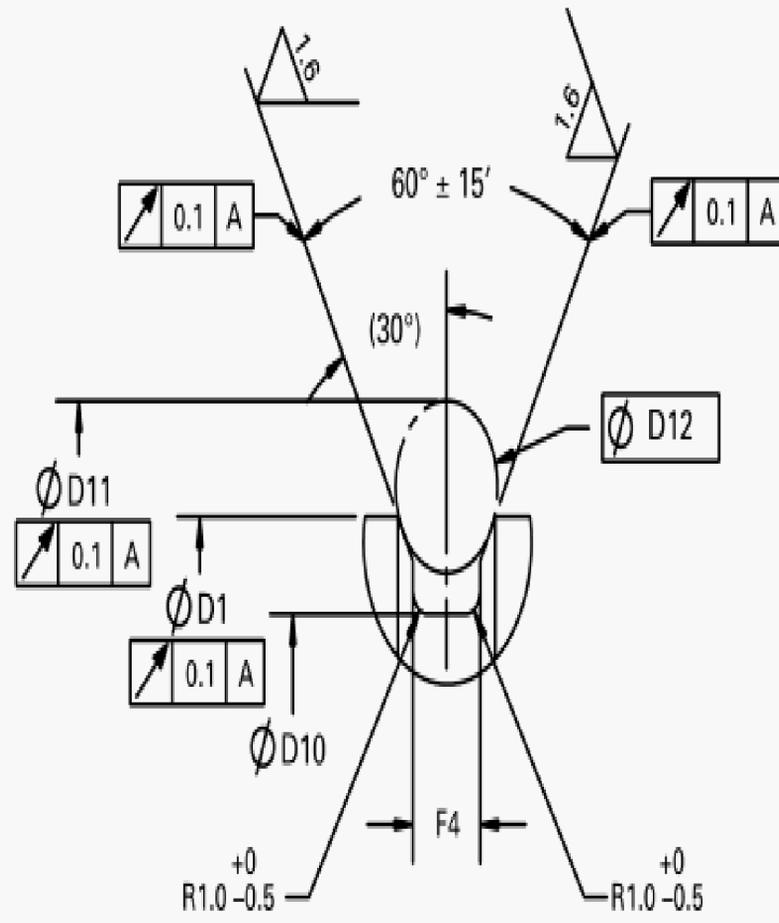
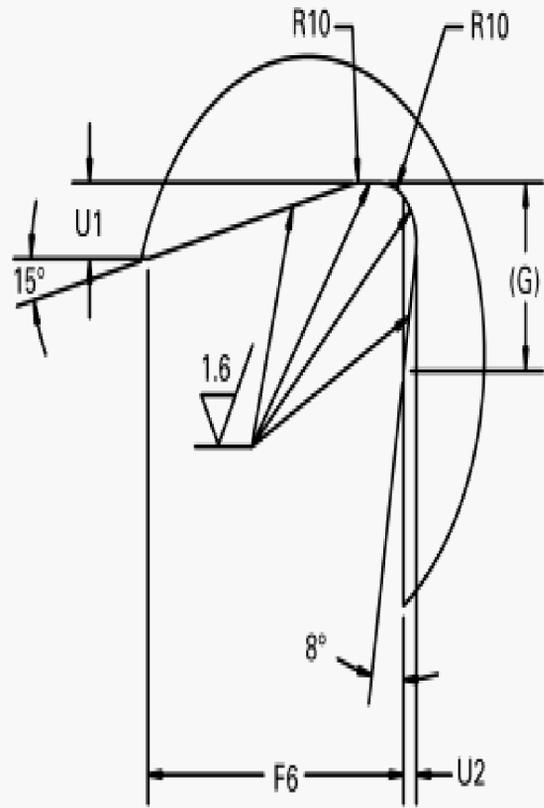


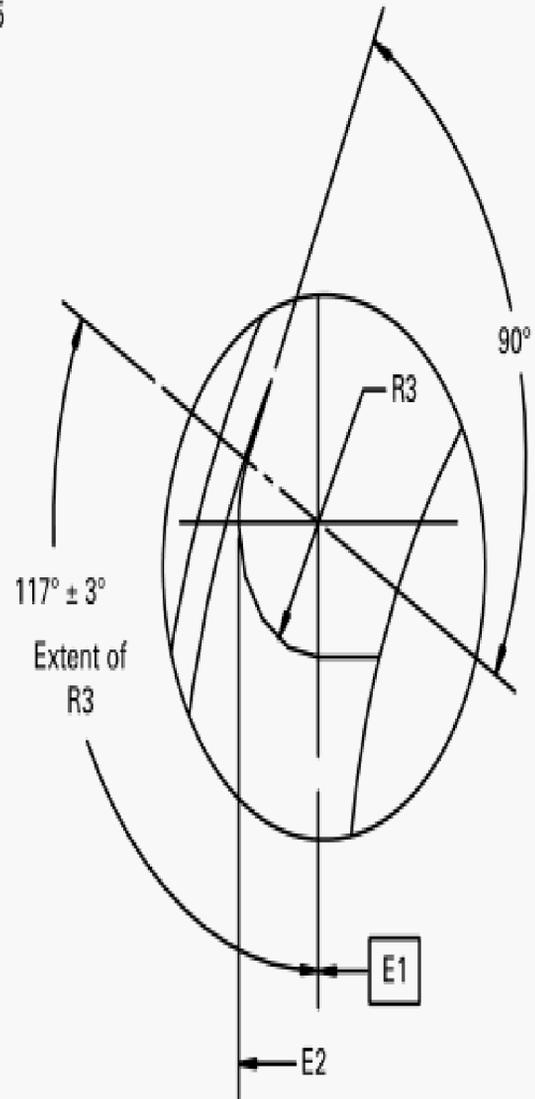
Figure 1-6-1 HSK Form T (Cont'd)



Detail X



Detail (R)



Detail Y

Table 1-6-1 Dimensions for HSK Form T

Dimension	Tolerance	Nominal Size							
		32	40	50	63	80	100	125	160
B1	+0.04 -0.04	7.05	8.05	10.54	12.54	16.04	20.02	25.02	30.02
B2	H10 [Note (1)]	7	9	12	16	18	20	25	32
B3	H10 [Note (1)]	9	11	14	18	20	22	28	36
B5	+0.03 -0	6.932	7.932	...	...	...	...	...	...
	+0.035 -0	...	...	10.425	12.425	15.93	19.91	...	...
	+0.04 -0	...	...	...	...	...	...	24.915	29.915
D1	H10 [Note (1)]	32	40	50	63	80	100	125	160
D2	...	24.007	30.007	38.009	48.010	60.012	75.013	95.016	120.016
D3	H10 [Note (1)]	17	21	26	34	42	53	67	85
D4	H11 [Note (1)]	20.5	25.5	32	40	50	53	80	100
D5	...	19	23	29	37	46	58	73	92
D6	Max.	4.2	5	6.8	8.4	10.2	12	14	16
D7	+0 -0.1	17.4	21.8	26.6	34.5	42.5	53.8	...	...
D8	...	4	4.6	6	7.5	8.5	12	...	...
D9	Max.	31	39	49	62	79	99	124	159
D10	+0 -0.1	26.5	34.8	43	55	70	92	117	152
D11	+0 -0.1	37	45	59.3	72.3	88.8	109.75	134.75	169.75
D12	...	4	4	7	7	7	7	7	7
D13	f8	6	8	10	12	14	16	18	20
D14	...	3.5	5	6.4	8	10	12	14	16
D15	...	M10 × 1	M12 × 1	M16 × 1	M18 × 1	M20 × 1.5	M24 × 1.5	M30 × 1.5	M35 × 1.5
E1	...	8.82	11	13.88	17.99	21.94	27.37	35.37	44.32
E2	+0 -0.05	10.20	12.88	16.26	20.87	25.82	32.25	41.25	52.2
F1	+0 -0.1	20	20	26	26	26	29	29	31
F2	Min.	23	23	30	30	30	34	34	36
F3	±0.1	16	16	18	18	18	20	20	22
F4	+0.15 -0	2	2	3.75	3.75	3.75	3.75	3.75	3.75
F6	+0.2 -0	1	2	2	2	2.5	2.5	4	4
(G)	...	0.9	1.1	1.4	1.4	1.8	1.8	3.1	3.1
H1	+0 -0.2	13	17	21	26.5	34	44	55.5	72
H2	+0 -0.3	9.5	12	15.5	20	25	31.5	39.5	50
H3	+0.2 -0	5.4	5.2	5.1	5	4.9	4.9	4.8	4.8
L1	+0 -0.2	16	20	25	32	40	50	63	80
L2	...	3.2	4	5	6.3	8	10	12.5	16
L3	+0.2 -0	5	6	7.5	10	12	15	19	23
L4	+0.2 -0	3	3.5	4.5	6	8	10	12	16
L5	JS10 [Note (1)]	8.92	11.42	14.13	18.13	22.85	28.56	36.27	45.98
L6	+0 -0.1	8	8	10	10	12.5	12.5	16	16
L7	+0.3 -0	0.8	0.8	1	1	1.5	1.5	2	2
L8	±0.1	5	6	7.5	9	12	15	...	...
L9	+0 -0.3	6	8	10	12	14	16	18	20
L12	...	12	12	19	21	22	24	24	24
L15	+0.3 -0	1.5	1.5	2	2	2.5	2.5	3.5	3.5
L17	Min.	1	1	1	1	1	1	1	1
L18	Min.	1	1	1	1	1	1	1	1

Table 1-6-1 Dimensions for HSK Form T (Cont'd)

Dimension	Tolerance	Nominal Size							
		32	40	50	63	80	100	125	160
R1	...	1.5	0.8	1	1.2	1.6	2	2.5	3.2
R2	+0 -0.2	0.8	1	1.5	1.5	2	2	2.5	2.5
R3 [Note (2)]	±0.05	1.38	1.88	2.38	2.88	3.88	4.88	5.88	7.88
R4	...	4	5	6	8	10	12	16	20
R5	...	0.4	0.4	0.5	0.6	0.8	1	1.2	1.6
R6	...	0.5	1	1.5	1.5	2	2	...	...
R7	...	1	1	1	1.5	1.5	1.5	1.5	1.5
R9 [Note (3)]	±0.1	3.5	4.5	6	...	...	...	5	5
	±0.2	...	...	...	8	9	10	...	...
R10	±0.1	0.2	0.4	0.6	0.6	1	1	1.6	1.6
T	...	0.002	0.002	0.0025	0.003	0.004	0.004	0.005	0.005
U1	+0.1 -0	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.3
U2	+0.05 -0	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2
O-ring [Note (4)]	...	16 × 1	18.77 × 1.78	21.89 × 2.62	29.82 × 2.62	36.09 × 3.53	47.6 × 3.53	...	...

GENERAL NOTES:

- (a) All dimensions are in millimeters.
- (b) Unless otherwise specified, angular dimensional tolerance shall be ±0.5 deg.
- (c) Unless otherwise specified, linear dimensional tolerance shall be ±0.2 mm.

NOTES:

- (1) Tolerance designations are per ASME B4.2.
- (2) R3 is tangent to B1 or B5.
- (3) R9 applies to B2 and B3.
- (4) For use with certain proprietary clamp sets (not supplied with standard tooling).

Figure 1-7-1 Identification Coding for HSK Shanks

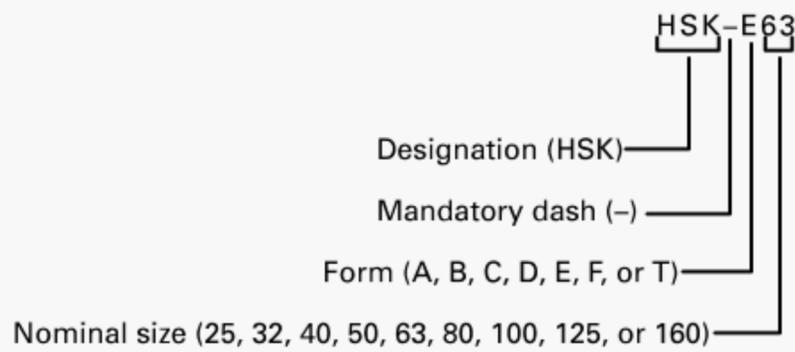


Table 1-7-1 Allowable Combinations of HSK Form, Nominal Size, and Features per ASME B5.62M

Form	Nominal Size									Feature			
	25	32	40	50	63	80	100	125	160	Data Chip	Access Hole	Notch	Coolant Tube
A	...	X	X	X	X	X	X	X	X	X	X	X	X
B	X	X	X	X	X	X	X	X	X	X	...
C	...	X	X	X	X	X	X	...	...	...	X	...	...
D	X	X	X	X	X	X	X	X	...	...	...
E	X	X	X	X	X	X	X	...	...	...	...	...	X
F	X	X	X	...	...	...	...	...	...	X
T	...	X	X	X	X	X	X	X	X	X	X	X	X

GENERAL NOTE: X = allowable.

Part 2

HSK Receivers

2-1 GENERAL

2-1.1 Scope

This Standard covers basic toolholder receivers with a 1/9.98 taper and simultaneous contact face and taper mating surfaces that are applicable to a range of machine tool applications. HSK receivers for Forms A and C, B and D, and E, F, and T with nominal flange diameters of 25 mm to 160 mm are covered by this Standard.

2-1.2 Interchangeability

Machine tool interfaces conforming to this Standard are interchangeable with machine tool interfaces conforming to DIN 69063:2001, ISO 12164-1:2001, ISO 12164-2:2001, and ISO 12164-3:2008.

2-1.3 Forms

The HSK machine tool interfaces as manufactured in the five basic receiver forms are suitable for use in a wide range of machine tool applications. See [para. 1-1.3](#) for corresponding form descriptions.

2-1.4 Figure Interpretation

The [Part 2](#) figures are illustrated and labeled in accordance with ASME Y14.5.

2-2 FORMS A AND C

[Figures 2-2-1](#) and [2-2-2](#) and [Table 2-2-1](#) show the geometry and dimensions of HSK receivers for Forms A and C.

2-3 FORMS B AND D

[Figures 2-3-1](#) and [2-3-2](#) and [Table 2-3-1](#) show the geometry and dimensions of HSK receivers for Forms B and D.

2-4 FORM E

[Figure 2-4-1](#) and [Table 2-4-1](#) show the geometry and dimensions of HSK receivers for Form E.

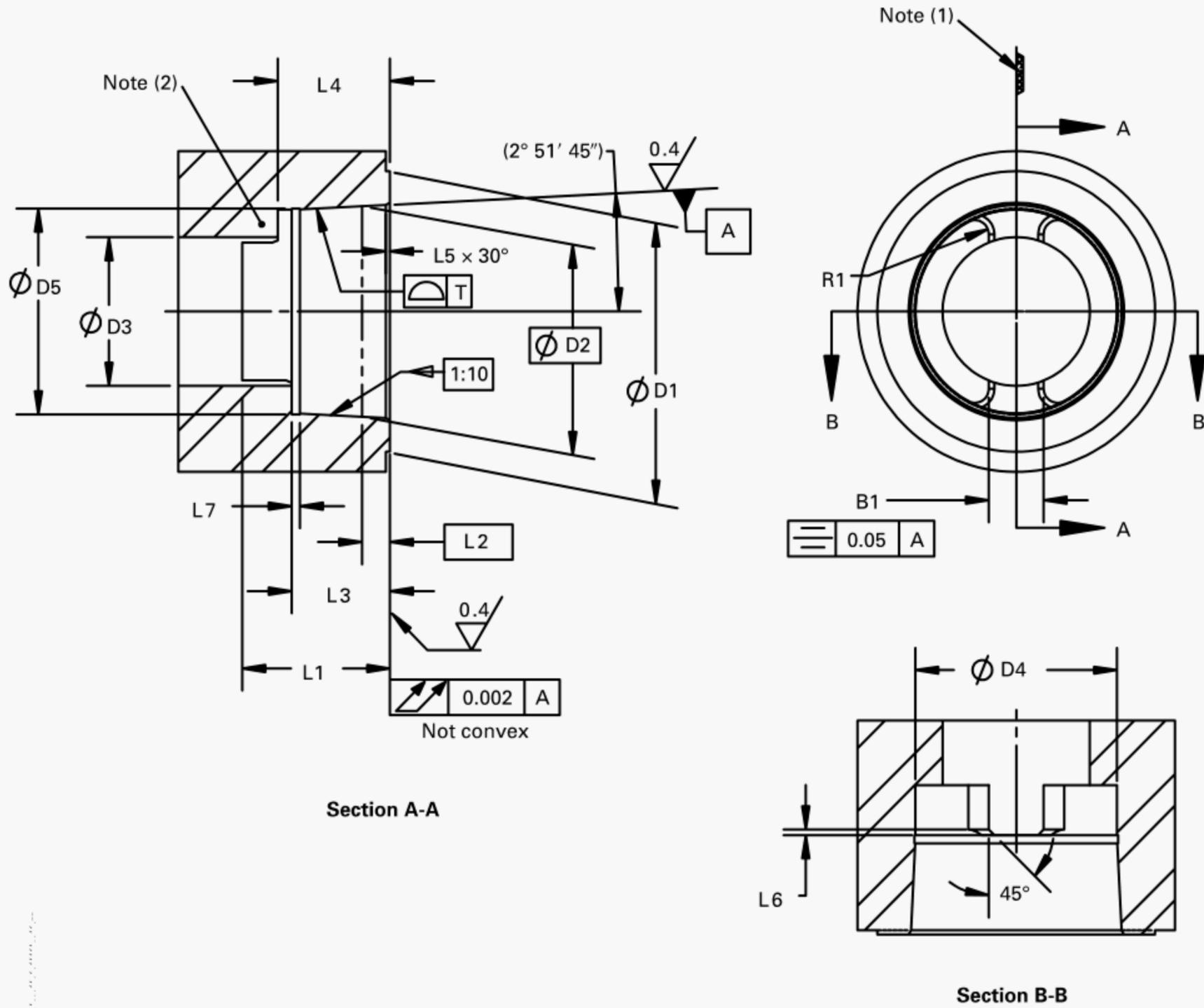
2-5 FORM F

[Figure 2-5-1](#) and [Table 2-5-1](#) show the geometry and dimensions of HSK receivers for Form F.

2-6 FORM T

[Figure 2-6-1](#) and [Table 2-6-1](#) show the geometry and dimensions of HSK receivers for Form T.

Figure 2-2-1 HSK Receiver, Form A



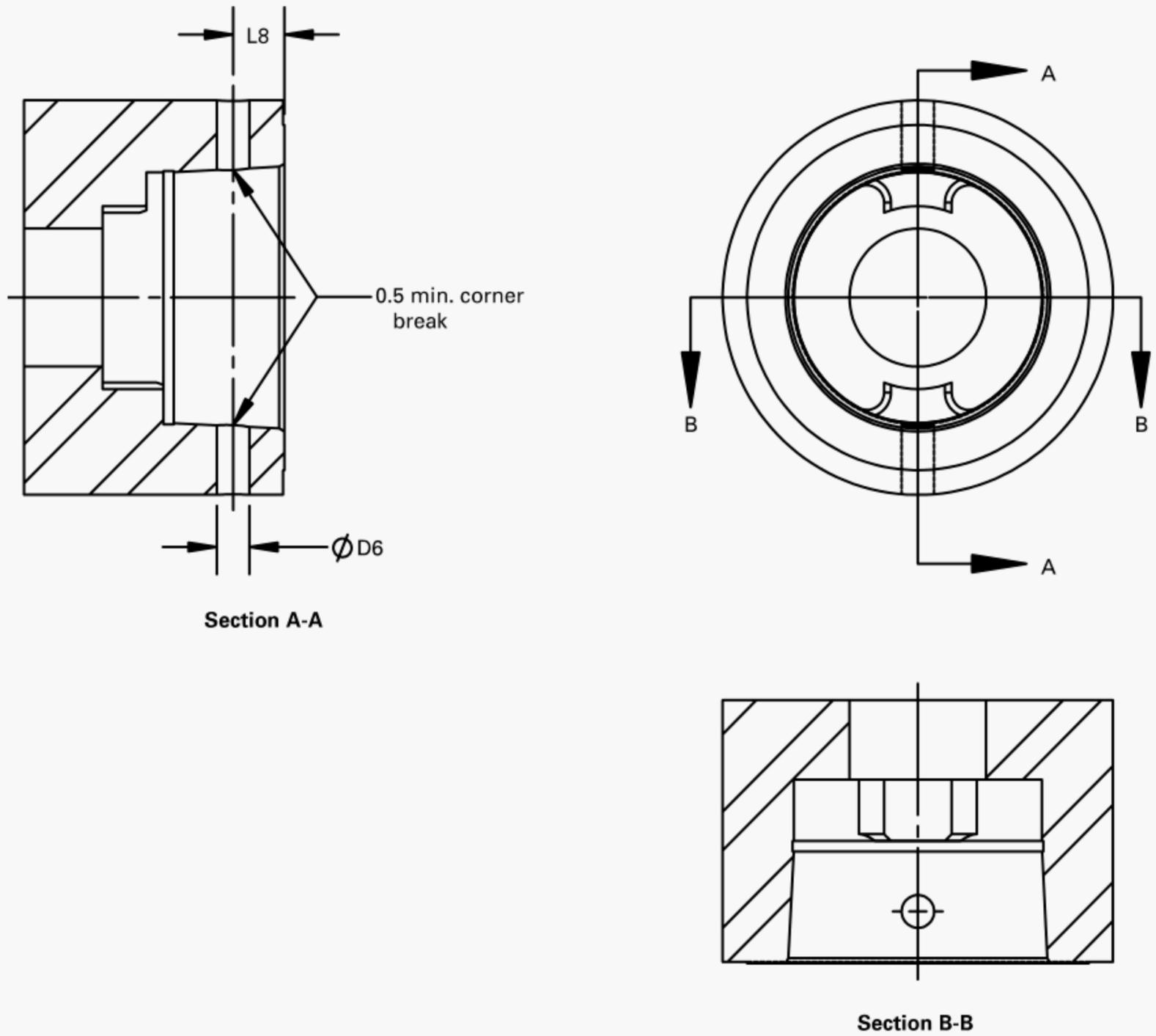
GENERAL NOTES:

- (a) See Table 2-2-1 for dimension values.
- (b) Surface texture is per ASME B46.1. Unless otherwise specified, surface texture, R_a , is $3.2 \mu\text{m}$.
- (c) Break all sharp edges.

NOTES:

- (1) Cutting-edge orientation (right-hand orientation) shown.
- (2) Drive keys may be integral or inserted.

Figure 2-2-2 HSK Receiver, Form C



GENERAL NOTES:

- (a) For dimensions not indicated in this figure, see [Figure 2-2-1](#).
- (b) See [Table 2-2-1](#) for dimension values.
- (c) Surface texture is per ASME B46.1. Unless otherwise specified, surface texture, R_a , is 3.2 μm .
- (d) Break all sharp edges.

Table 2-2-1 Dimensions for HSK Receivers, Forms A and C

Dimension	Tolerance	Nominal Size							
		32	40	50	63	80	100	125	160
B1	±0.05	6.8	7.8	10.3	12.3	15.8	19.78	24.78	29.78
D1	Min.	32	40	50	63	80	100	125	160
D2	...	23.998	29.998	37.998	47.998	59.997	74.997	94.996	119.995
D3	...	Diameter depends on the clamping system							
D4 [Note (1)]	+0.1 -0	23.28	29.06	36.85	46.53	58.1	72.6	92.05	116.1
D5	+0.2 -0	23.8	29.6	37.5	47.2	58.8	73.4	93	118
D6	...	Hole diameter determined by the manufacturer							
L1 [Note (1)]	+0.2 -0	16.5	20.5	25.5	33	41	51	64	81
L2	...	3.2	4	5	6.3	8	10	12.5	16
L3	+0.2 -0	11.4	14.4	17.9	22.4	28.4	35.4	44.4	57.4
L4	+0.2 -0	13.4	16.9	20.9	26.4	32.4	40.4	51.4	64.4
L5	±0.1	0.8	0.8	1	1	1.5	1.5	2	2
L6	+0.1 -0	1	1	1.5	1.5	2	2	2.5	2.5
L7	±0.1	2	2	2	2.5	3	3	4	4
L8	±0.1	5	6	7.5	9	12	15	...	...
R1 [Note (2)]	+0 -0.05	1.5	2	2.5	3	4	5	6	8
T	...	0.0015	0.0015	0.002	0.002	0.0025	0.003	0.0035	0.0035

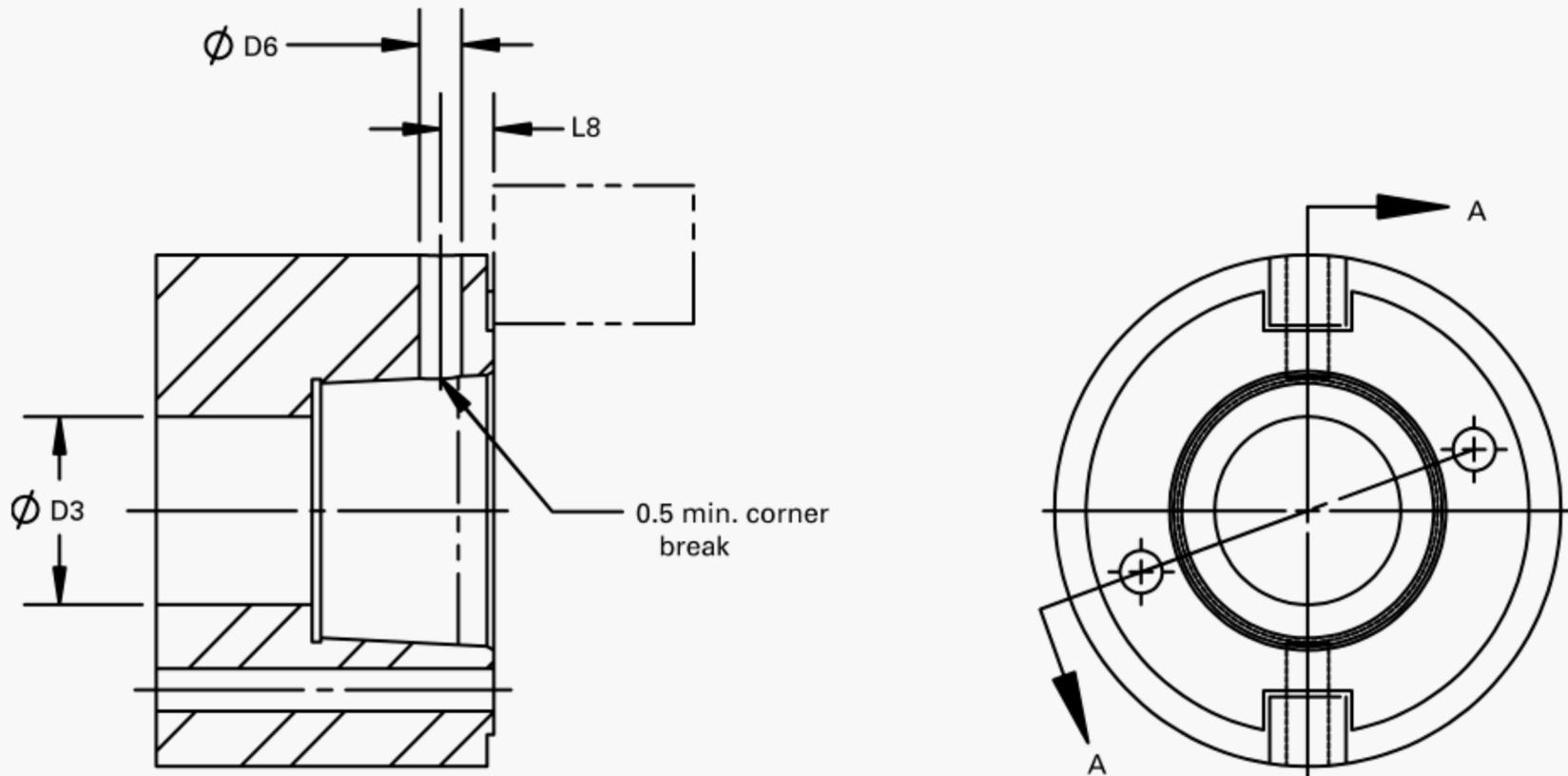
GENERAL NOTES:

- (a) All dimensions are in millimeters.
- (b) Unless otherwise specified, angular dimensional tolerance shall be ±0.5 deg.
- (c) Unless otherwise specified, linear dimensional tolerance shall be ±0.2 mm.
- (d) Tolerance designations are per ASME B4.2.

NOTES:

- (1) When using inserted drive keys, the bore (D4) may be tapered the full depth (L1).
- (2) R1 is tangent to B1 and D4.

Figure 2-3-2 HSK Receiver, Form D



Section A-A

GENERAL NOTES:

- (a) For dimensions not indicated on this figure, see [Figure 2-3-1](#).
- (b) See [Table 2-3-1](#) for dimension values.
- (c) Surface texture is per ASME B46.1. Unless otherwise specified, surface texture, R_a , is 3.2 μm .
- (d) Break all sharp edges.

Table 2-3-1 Dimensions for HSK Receivers, Forms B and D

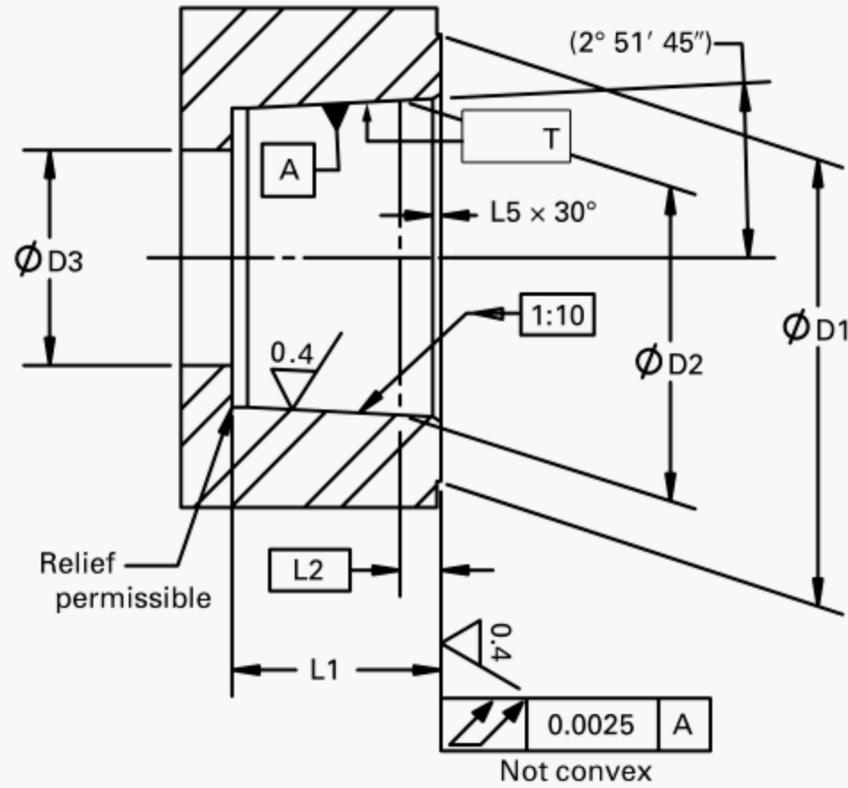
Dimension	Tolerance	Nominal Size						
		40	50	63	80	100	125	160
B1	H5 [Note (1)]	9.9	11.9	15.9	17.9	19.9	24.9	31.9
B2	±0.1	1	1	1	1	2	2	2
D1	Min.	40	50	63	80	100	125	160
D2	...	23.998	29.998	37.998	47.998	59.997	74.997	94.996
D3	...	Diameter depends on the clamping system						
D6	...	Hole diameter determined by the manufacturer						
D7	...	3	3.5	5	6	7	8.5	10
E1	+0.2 -0	16.2	20.2	25.2	31.7	40.2	50.2	62.7
F1	Max.	19.5	25.5	25.5	25.5	28.5	28.5	30.5
L1	+0.3 -0	16.5	20.5	25.5	33	41	51	64
L2	...	3.2	4	5	6.3	8	10	12.5
L5	±0.1	0.8	1	1	1.5	1.5	2	2
L8	±0.1	6	7.5	9	12	15	...	...
L9	+0.1 -0	16	20	25	32	40	50	63
T	...	0.0015	0.0015	0.002	0.002	0.0025	0.003	0.0035

GENERAL NOTES:

- (a) All dimensions are in millimeters.
 (b) Unless otherwise specified, angular dimensional tolerance shall be ±0.5 deg.
 (c) Unless otherwise specified, linear dimensional tolerance shall be ±0.2 mm.

NOTE: (1) Tolerance designations are per ASME B4.2.

Figure 2-4-1 HSK Receiver, Form E



GENERAL NOTES:

- (a) See Table 2-4-1 for dimension values.
- (b) Surface texture is per ASME B46.1.
- (c) Break all sharp edges.
- (d) Surface texture is per ASME B46.1. Unless otherwise specified, surface texture, R_a , is $3.2 \mu\text{m}$.

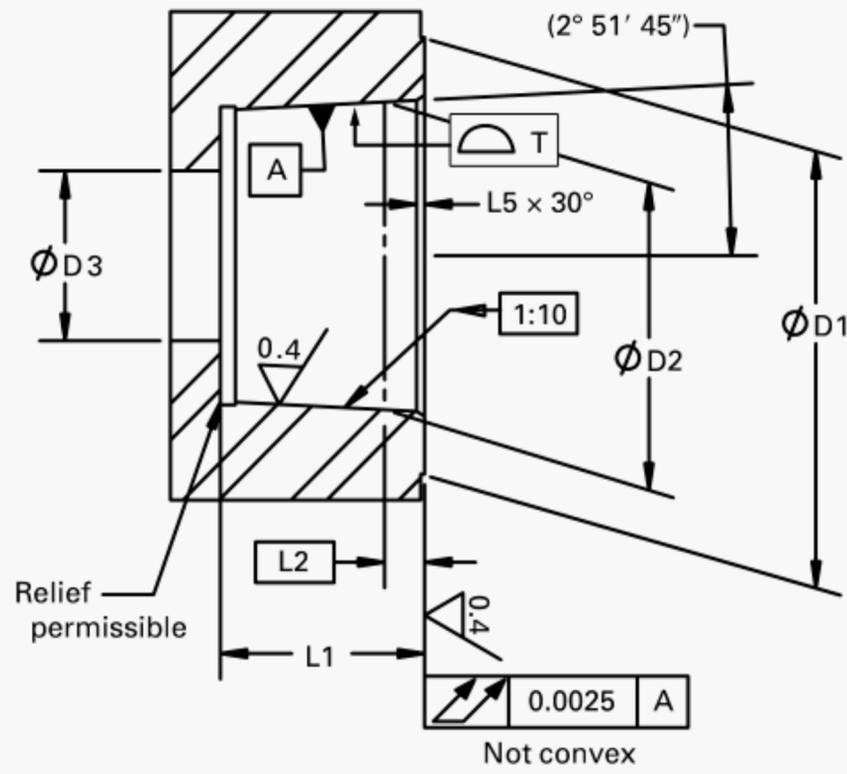
Table 2-4-1 Dimensions for HSK Receivers, Form E

Dimension	Tolerance	Nominal Size							
		32	40	50	63	80	100	125	160
D1	Min.	32	40	50	63	80	100	125	160
D2	...	23.998	29.998	37.998	47.998	59.997	74.997	94.996	119.995
D3	...	Diameter depends on the clamping system							
L1	+0.2 -0	16.5	20.5	25.5	33	41	51	64	81
L2	...	3.2	4	5	6.3	8	10	12.5	16
L5	± 0.1	0.8	0.8	1	1	1.5	1.5	2	2
T	...	0.0015	0.0015	0.002	0.002	0.0025	0.003	0.0035	0.0035

GENERAL NOTES:

- (a) All dimensions are in millimeters.
- (b) Unless otherwise specified, angular dimensional tolerance shall be ± 0.5 deg.
- (c) Unless otherwise specified, linear dimensional tolerance shall be ± 0.2 mm.

Figure 2-5-1 HSK Receiver, Form F



GENERAL NOTES:

- (a) See Table 2-5-1 for dimension values.
- (b) Surface texture is per ASME B46.1. Unless otherwise specified, surface texture, R_a , is 3.2 μm .
- (c) Break all sharp edges.

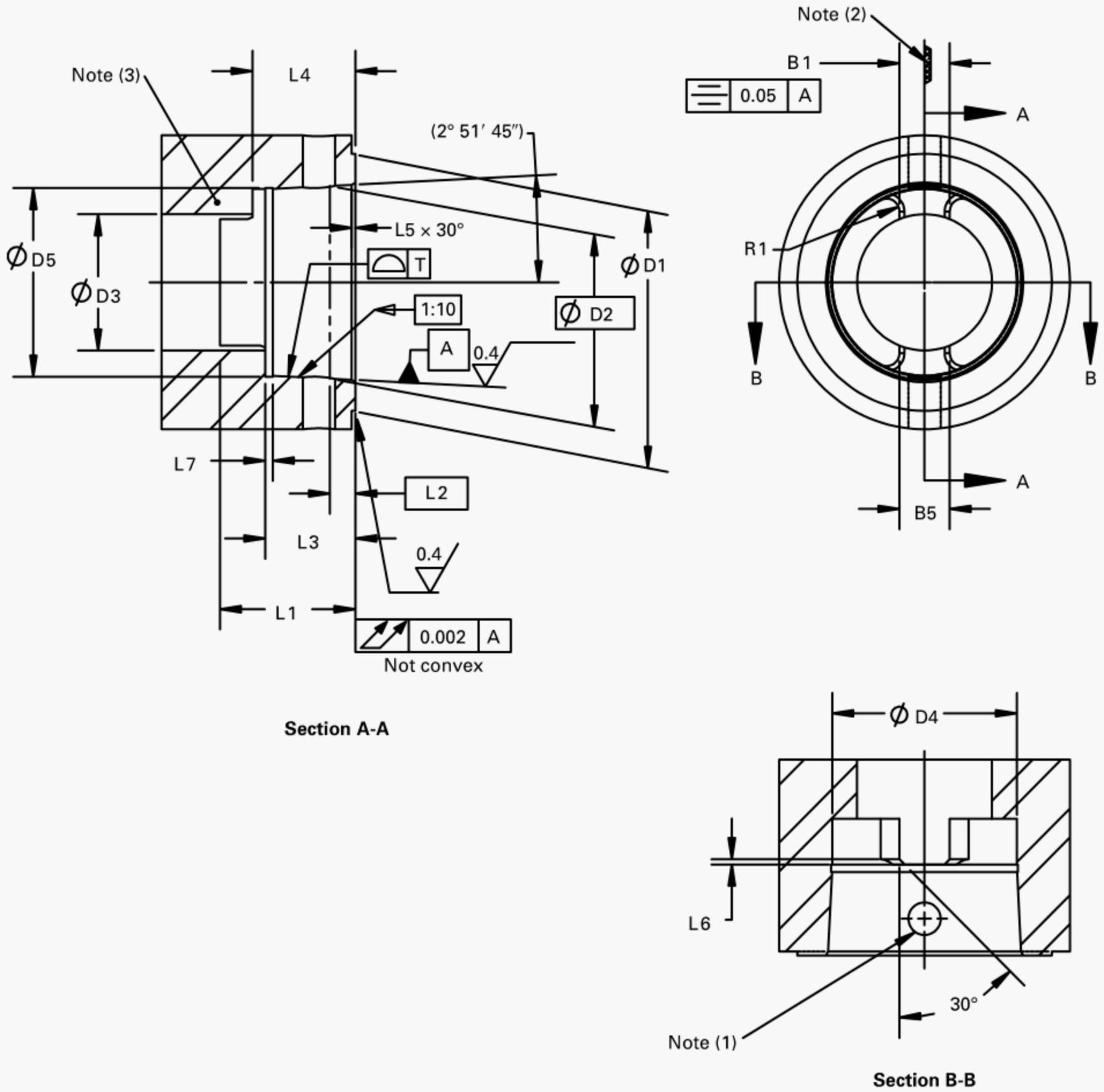
Table 2-5-1 Dimensions for HSK Receivers, Form F

Dimension	Tolerance	Nominal Size		
		50	63	80
D1	Min.	50	63	80
D2	...	29.998	37.996	47.995
D3	...	Diameter depends on the clamping system		
L1	...	20.5	25.5	33
L2	...	4	5	6.3
L5	± 0.1	0.8	1	1
T	...	0.001	0.0015	0.002

GENERAL NOTES:

- (a) All dimensions are in millimeters.
- (b) Unless otherwise specified, angular dimensional tolerance shall be ± 0.5 deg.
- (c) Unless otherwise specified, linear dimensional tolerance shall be ± 0.2 mm.

Figure 2-6-1 HSK Receiver, Form T



GENERAL NOTES:

- (a) See Table 2-6-1 for dimension values.
- (b) Surface texture is per ASME B46.1. Unless otherwise specified, surface texture, R_a , is 3.2 μm .
- (c) Break all sharp edges.

NOTES:

- (1) Optional access hole for manual clamping.
- (2) Cutting-edge orientation (right-hand orientation) shown.
- (3) Drive keys may be integral or inserted.

Table 2-6-1 Dimensions for HSK Receivers, Form T

Dimension	Tolerance	Nominal Size							
		32	40	50	63	80	100	125	160
B1	±0.05	6.8	7.8	10.3	12.3	15.8	19.78	24.78	29.78
B5	+0 -0.025	6.92	7.92	10.41	12.41	...	...	...	...
	+0 -0.03	...	...	...	...	15.91	19.89	24.89	29.89
D1	Min.	32	40	50	63	80	100	125	160
D2	...	23.998	29.998	37.998	47.998	59.997	74.997	94.996	119.995
D3 [Note (1)]	...	17	21	26	34	42	53	67	85
D4 [Notes (2), (3)]	+0.1 -0	23.28	29.06	36.85	46.53	58.1	72.6	92.05	116.1
D5	...	23.8	29.6	37.5	47.2	58.8	73.4	93	118
D6 [Note (4)]	...	Hole diameter determined by the manufacturer							
L1 [Note (3)]	+0.2 -0	16.5	20.5	25.5	33	41	51	64	81
L2	...	3.2	4	5	6.3	8	10	12.5	16
L3	+0.2 -0	11.4	14.4	17.9	22.4	28.4	35.4	44.4	57.4
L4	+0.2 -0	13.4	16.9	20.9	26.4	32.4	40.4	51.4	64.4
L5	±0.1	0.8	0.8	1	1	1.5	1.5	2	2
L6	+0.1 -0	1	1	1.5	1.5	2	2	2.5	2.5
L7	±0.1	2	2	2	2.5	3	3	4	4
L8 [Note (4)]	±0.1	5	6	7.5	9	12	15	...	...
R1 [Note (5)]	+0 -0.05	1.5	2	2.5	3	4	5	6	8
T	...	0.0015	0.0015	0.002	0.002	0.0025	0.003	0.0035	0.0035

GENERAL NOTES:

- All dimensions are in millimeters.
- Unless otherwise specified, angular dimensional tolerance shall be ±0.5 deg.
- Unless otherwise specified, linear dimensional tolerance shall be ±0.2 mm.
- Tolerance designations are per ASME B4.2.

NOTES:

- Dimensions can be different, depending on clamping system.
- Corner break is 0.2 mm to 0.5 mm.
- When using inserted drive keys, the bore (D4) may be tapered the full depth (L1).
- Optional manual clamping access hole.
- R1 is tangent to B1 or B2 and to D4.

Mandatory Appendix I References

I-1 REFERENCES INCORPORATED INTO ASME B5.62M

The following publications form a part of this Standard to the extent specified herein. More recent editions may be used, provided there is no conflict with the text of this Standard.

- ASME B4.2-1978, Preferred Metric Limits and Fits
 ASME B46.1-2009, Surface Texture (Surface Roughness, Waviness, and Lay)
 ASME Y14.5-2009, Dimensioning and Tolerancing
 Publisher: The American Society of Mechanical Engineers (ASME), Two Park Avenue, New York, NY 10016-5990 (www.asme.org)
- DIN 69873:1993, Data Media for Tools and Clamping Devices; Dimensions for Data Media and Their Mounting Space
 DIN 69893-1:2003, Hollow Taper Shanks With Flange Contact Surface — Part 1: Hollow Taper Shanks Type A and Type C; Dimensions and Design
 DIN 69893-2:2003, Hollow Taper Shanks With Flange Contact Surface — Part 2: Hollow Taper Shanks Type B and Type D; Dimensions and Design
 DIN 69893-5:2004, Hollow Taper Shanks With Flange Contact Surface — Part 5: Hollow Taper Shanks Type E; Dimensions and Design
 DIN 69893-6:2003, Hollow Taper Shanks With Flange Contact Surface — Part 6; Dimensions and Design
 Publisher: Deutsches Institut für Normung e. V. (DIN), Am DIN-Platz, Burggrafenstrasse 6, 10787 Berlin, Germany (www.din.de); Foreign Orders: Beuth Verlag GmbH, 10772 Berlin, Germany

Final Report on the Research Project — Study on Design Possibilities for the Connection Machine / Tool, August 15, 1991

Final Report on the Research Project Interface Machine/ Tool: Testing and Optimization of Machine Tools, March 1994

Publisher: Werkzeugmaschinenlabor, Rheinisch-Westfaelische Technische Hochschule (RWTH) Aachen University, D-52056 Aachen, Germany (www.wzl.rwth-aachen.de/en/index.htm)

I-2 ADDITIONAL REFERENCES

The following is a list of publications referenced in this Standard:

- ISO 12164-1:2001, Hollow taper interface with flange contact surface — Part 1: Shanks — Dimensions
 ISO 12164-2:2001, Hollow taper interface with flange contact surface — Part 2: Receivers — Dimensions
 ISO 12164-3:2008, Hollow taper interface with flange contact surface — Part 3: Dimensions of shanks for stationary tools
 ISO 12164-4:2008, Hollow taper interface with flange contact surface — Part 4: Dimensions of receivers for stationary tools
 Publisher: International Organization for Standardization (ISO), Central Secretariat, Chemin de Blandonnet 8, Case Postale 401, 1214 Vernier, Geneva, Switzerland (www.iso.org)

Nonmandatory Appendix A

Recommendations for Use and Applications of HSK Forms A, C, and T

A-1 SCOPE

This Appendix covers the use and application of HSK Forms A, C, and T. Information on HSK Forms B, D, E, and F, for which unique, application-specific data apply, is not presented in this Appendix.

A-2 FACTORS AFFECTING HSK TOOL-HOLDING SYSTEMS

A-2.1 Retention System

The HSK toolholder is attached to the socket of the machine tool via one of various proprietary retention systems.

HSK tool-to-spindle connections require sufficient force pulling the shank into the receiver to achieve the performance characteristics described in (a) through (d) below. These characteristics are directly affected by the amount of pulling force, and because of this, performance characteristics of the toolholder-to-spindle connection will change if drawbar force changes. At tool change, the drawbar pull force elastically deforms the shank taper until enough surface-area contact is made to distribute point contact forces, seat the taper, and achieve face contact. The performance characteristics affected by drawbar pull force are as follows:

- (a) positional accuracy and stability of the machine tool
- (b) resistance to torque-induced slippage at the toolholder-spindle interface
- (c) resistance to pulling out (unseating the taper) during heavy cuts
- (d) vibration characteristics of the machining system

A-2.2 Clamping Forces

Variations of manufacturing tolerances will result in differing levels of retention force acting on the face contact area. The forces given in Table A-2.2-1 ensure

Table A-2.2-1 Pull Force, kN, for HSK Forms A, C, and T

Form	Nominal Size, mm							
	32	40	50	63	80	100	125	160
A and C	5	6.8	11	18	28	45	70	115
T	5	8	14	24	37	55	86	150

that the force acting on the face is never less than 75% of the total retention force. The face contact is fundamental for torque transmittal and for the rigidity of the hollow taper interface.

A-2.3 Theoretical Speed, Torque, and Bending Moment

ASME B5.62M defines the hollow taper shank interface. Table A-2.3-1 offers guidelines for speed, torque, and bending moment, but these are not intended to specify allowable maximums. Frequent operation near or above these values will result in accelerated wear and breakage of equipment. The manufacturer is responsible for supplying information regarding the capacity of its toolholders.

A-2.4 Material and Heat Treatment

Materials for shanks and receivers should be selected and heat treated to optimize hardness, strength, toughness, and wear resistance. Ideally, the surface hardness of a shank should be slightly less than that of the receiver.

A-2.5 Balancing

All components of the tool-holding system, i.e., the tool, toolholder, and spindle shaft, should be balanced. Toolholder balance may be achieved by minimal metal removal in the locations of the manufacturer's choice. Balance should not be pursued to unnecessarily high levels.

See Figure A-2.5-1 for preferred balancing zones.

A-3 COOLANT TUBE

The coolant tube, shown in Figure A-3-1, serves to transfer the coolant from the spindle to the toolholder. The coolant tube is subject to the following considerations:

- (a) The coolant tube must create a seal between the clamp set and the toolholder.
- (b) As the toolholder and spindle may not be perfectly aligned during a tool change, the coolant tube must have ± 1 -deg angular compliance with little resistance.
- (c) The tube surface must be hardened to a minimum of 56 Rockwell C.

(d) The seal inside the clamp set will slide over the tube. This seal will be subject to wear and should be replaced periodically.

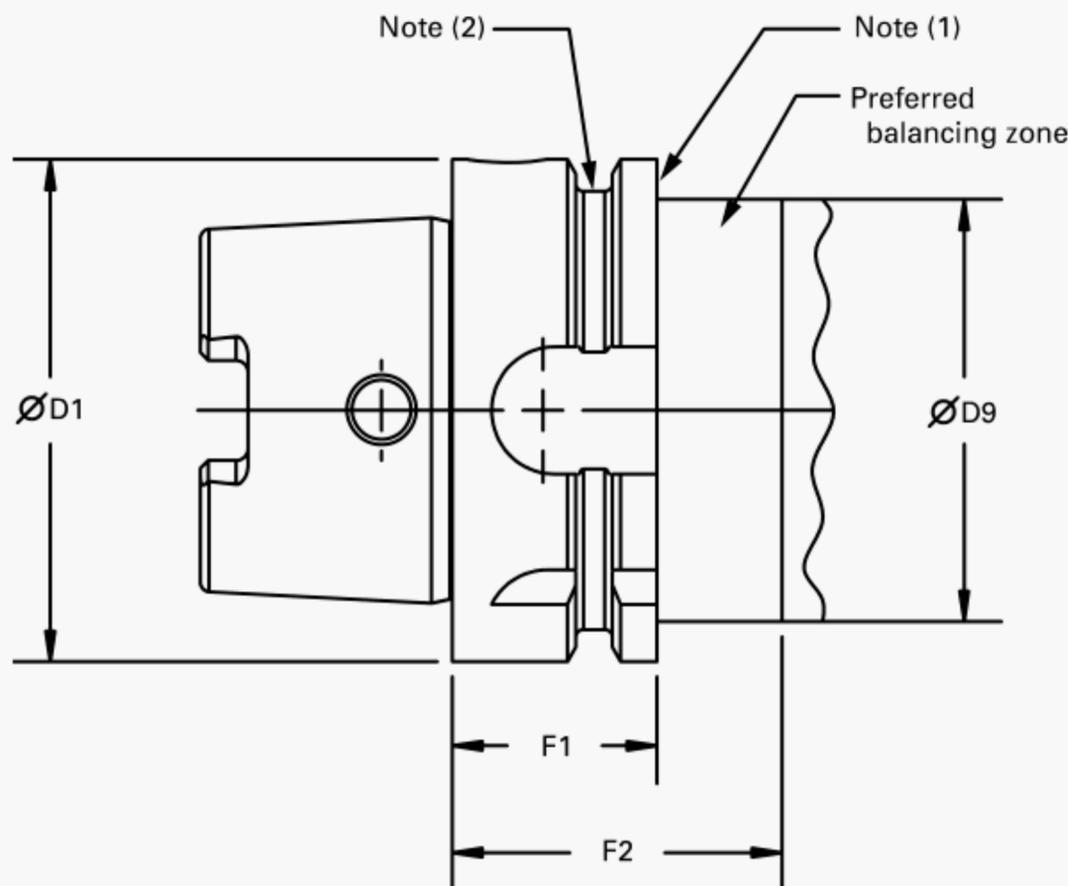
(e) Operating a toolholder system without a coolant tube or without seal integrity will cause problems such as

- (1) leakage of coolant into the spindle, causing corrosion and bearing or electrical failure
- (2) failure of the toolholder interface to release, due to hydraulic lockup
- (3) compromised clamp-set lubrication, resulting in reduced retention force

Table A-2.3-1 Theoretical Speed, Torque, and Bending Moment

Parameter	Nominal Size							
	32	40	50	63	80	100	125	160
Speed, rpm	42 000	30 000	26 000	21 000	16 000	13 000	10 000	7 000
Torque, N·m	11	20	41	85	169	335	652	1 336
Bending moment, N·m	139	210	348	630	960	1 900	3 300	7 000

Figure A-2.5-1 Preferred Balancing Zones

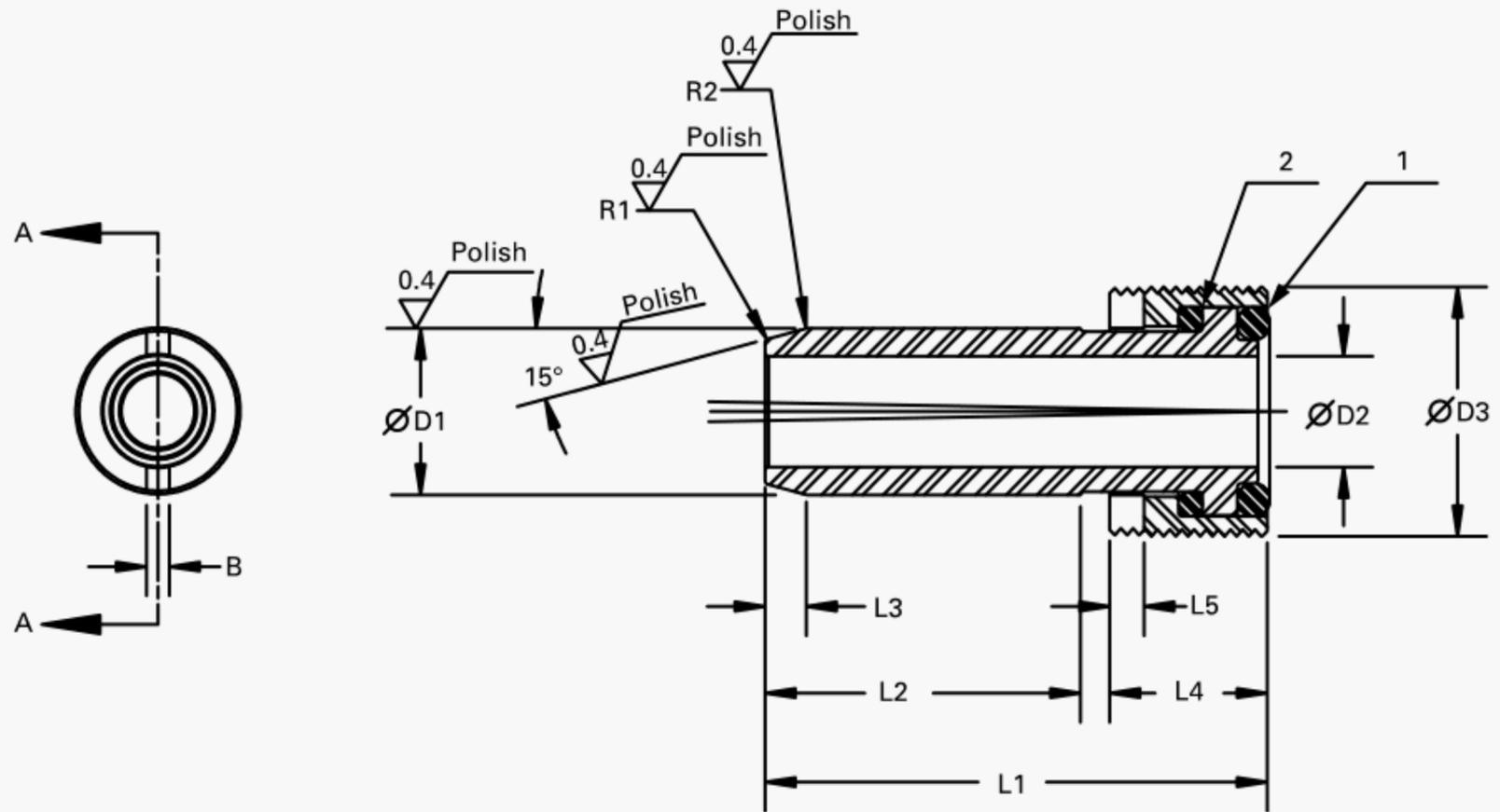


GENERAL NOTE: See [Table 1-2-1](#) for dimension values.

NOTES:

- (1) When balancing is desired after mounting of the cutting tool, it should be confined to the preferred balancing zone.
- (2) As an alternative to the recommendation in Note (1), balancing may be achieved by removing material from the root of the tool-change groove.

Figure A-3-1 Coolant Tube



Dimension	Tolerance	Nominal Size									
		25	32	40	50	63	80	100	125	160	
B	+0.2	1.5	1.5	2	2	2.5	2.5	3	4	5	
D1	f8 [Note (1)]	5	6	8	10	12	14	16	18	20	
D2	...	3	3.5	5	6.4	8	10	12	14	16	
D3	...	M8 × 1	M10 × 1	M12 × 1	M16 × 1	M18 × 1	M20 × 1.5	M24 × 1.5	M30 × 1.5	M35 × 1.5	
L1	+0 -0.5	17	26	29.5	33	36.5	40	44	48	52	
L2	Min.	14	16	16	19	20	20	23	25	25	
L3	...	2	2.5	2.5	3	3	3	3	3.5	3.5	
L4	-0.2	4.5	5.5	7.5	9.5	11.5	13.5	15.5	17.5	19.4	
L5	+0.2	1.5	1.5	2	2	2.5	2.5	3	3.5	3.5	
R1	...	0.4	1	1	1	1.5	1.5	1.5	1.5	1.5	
R2	...	1.6	2	2	2	3	3	3	3	3	
Torque, N·m	...	5	5	10	15	20	25	30	30	30	
1 (O-ring)	...	4 × 1	5 × 1.2	7.5 × 1.5	9 × 2	10 × 2.5	13 × 2	14 × 3	17 × 3.5	20 × 3.5	
2 (O-ring)	...	Dimensions determined by the manufacturer									

GENERAL NOTE: Unless otherwise noted, dimensions are in millimeters.

NOTE: (1) Tolerance designations are per ASME B4.2.

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