

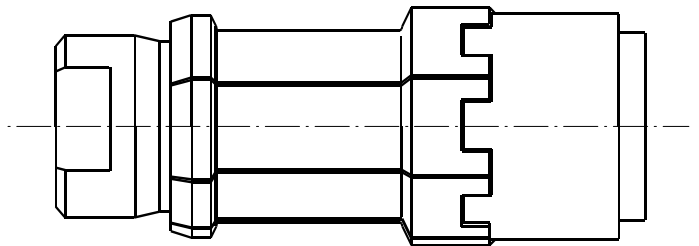
OTT

Spanntechnik

JAKOB

Product Information

Clamping-Unit HSK



ENGLISH

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**JAKOB
GRUPPE**

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symbol explanation:



keep attention -
dangerous

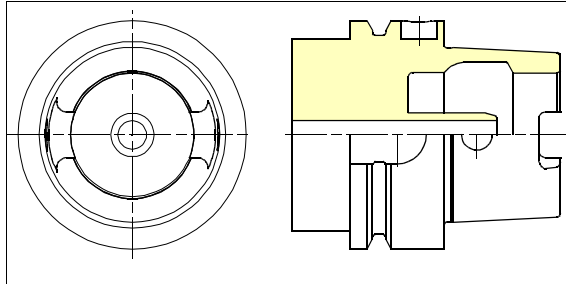


keep attention -
malfunction

1 Product Description

1.1 Standard

hollow shaft taper ISO / CD 12164-1; form **A**



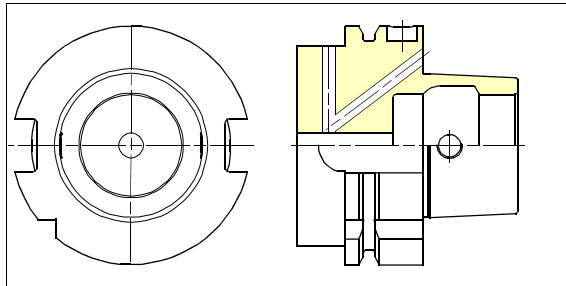
features:

- central, axial coolant supply with KSM-tube
- keyways at the taper end

application:

- machining centers, milling machines

hollow shaft taper DIN 69893-2; form **B**



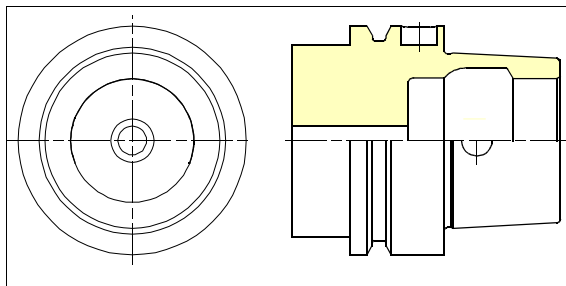
features:

- decentralized coolant supply over the flange or central coolant supply through coolant tube
- enlarged flange
- keyways at the flange

application:

- machining centers, heavy milling machines

hollow shaft taper DIN 69893-5; form **E**



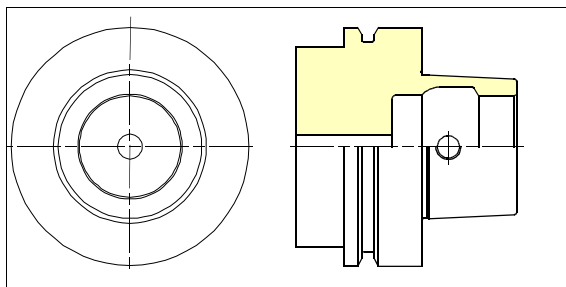
features:

- rotational symmetry without keyways

application:

- HSC-spindles

hollow shaft taper DIN 69893-6; form **F**



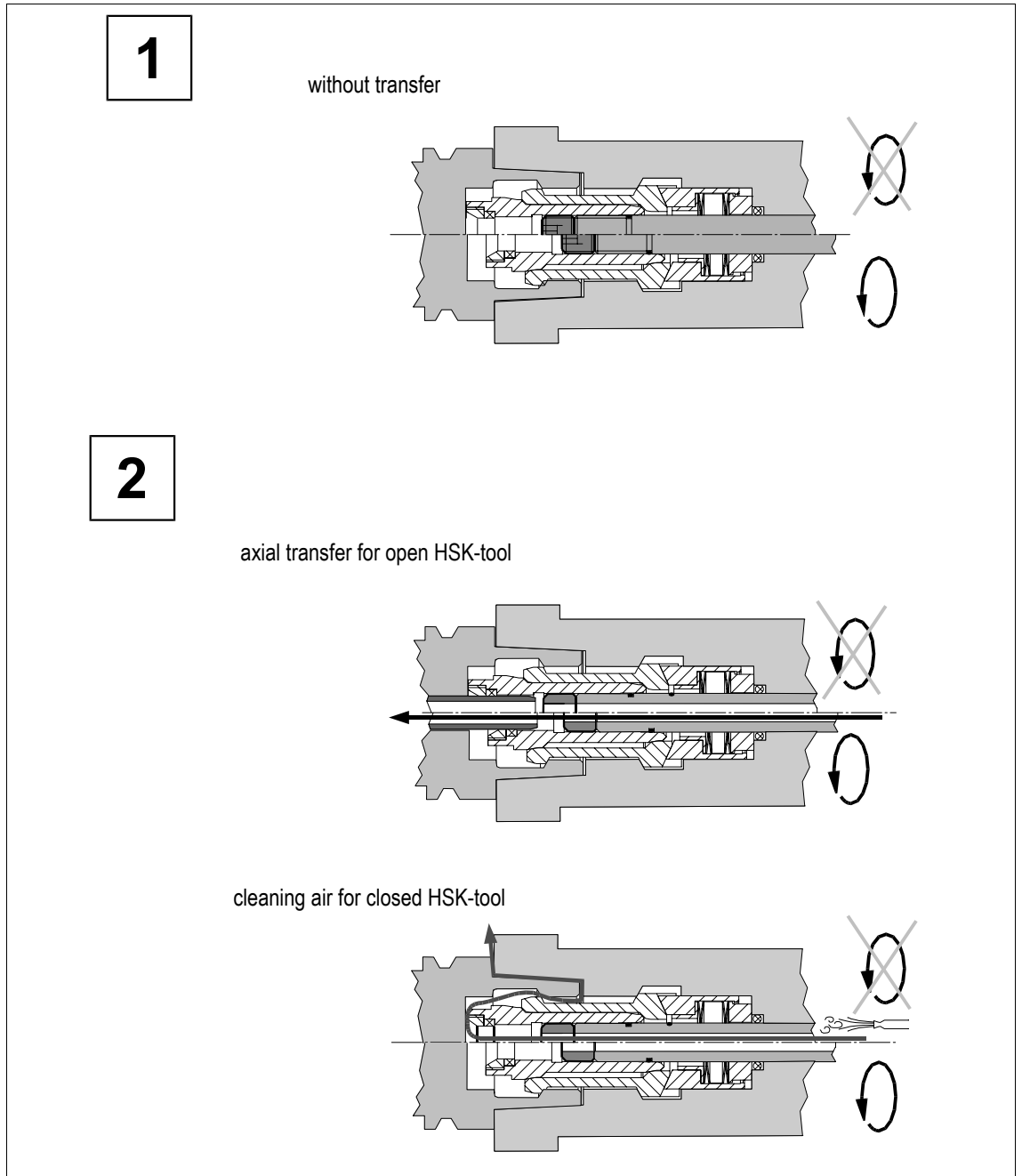
features:

- enlarged flange

application:

- HSC-spindles e. g. machining of wood and plastic

1.2 Medium transfer



1.3 Ceiling speed

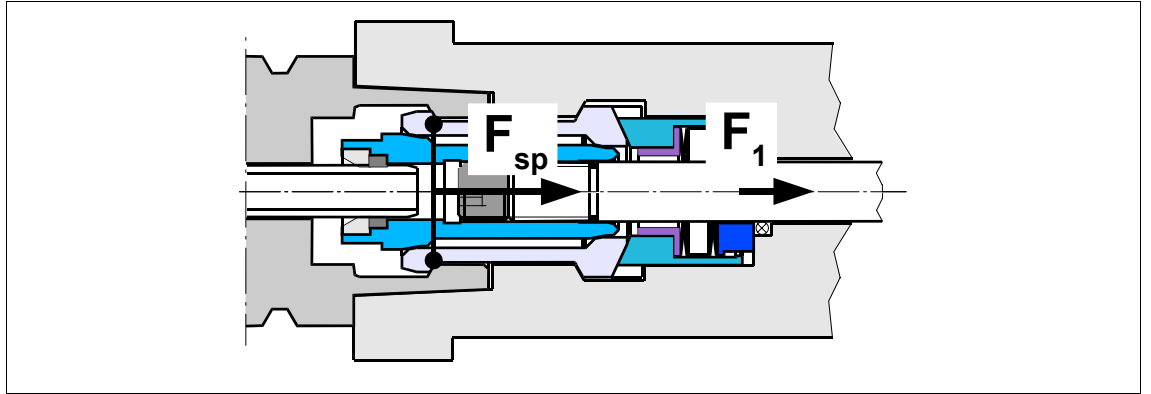
		nominal size								min ⁻¹
		25	32	40	50	63	80	100	125	
tool standard	A	-	57294	45989	37336	27201	20897	15466	12561	8596
	B	-	-	46787	33115	25535	19223	14698	11184	8560
	E	80124	57279	45728	39367	32691	-	-	-	-
	F	-	-	-	39170	31262	22967	-	-	-

1.4 Transferable torque

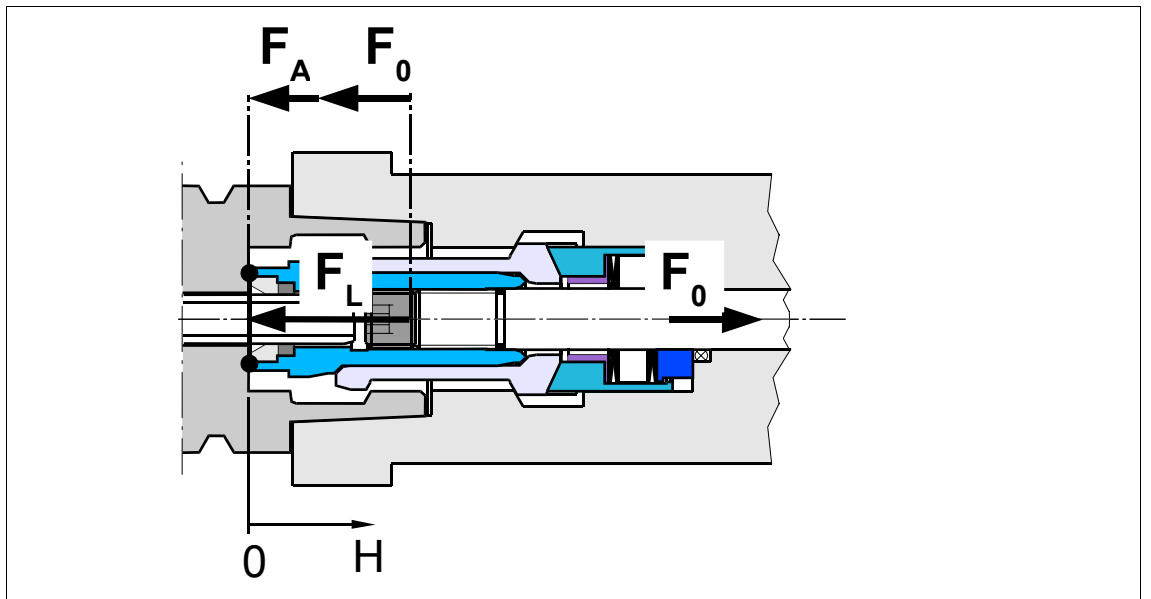
		nominal size								Nm	transferable torque without keyways
		25	32	40	50	63	80	100	125		
tool standard	A	-	14	24	48	97	190	365	710	1436	
	B	-	-	16	28	55	113	217	422	835	
	E	7	15	27	56	110	-	-	-	-	
	F	-	-	-	31	64	128	-	-	-	

1.5 Forces at the HSK-clamping unit

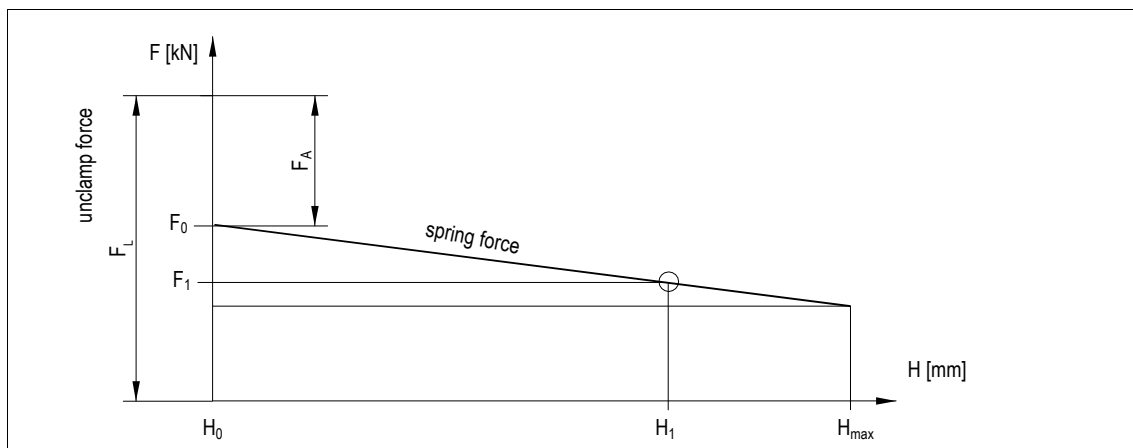
1.5.1 Clamped position



1.5.2 Unclamped position



1.5.3 Diagram

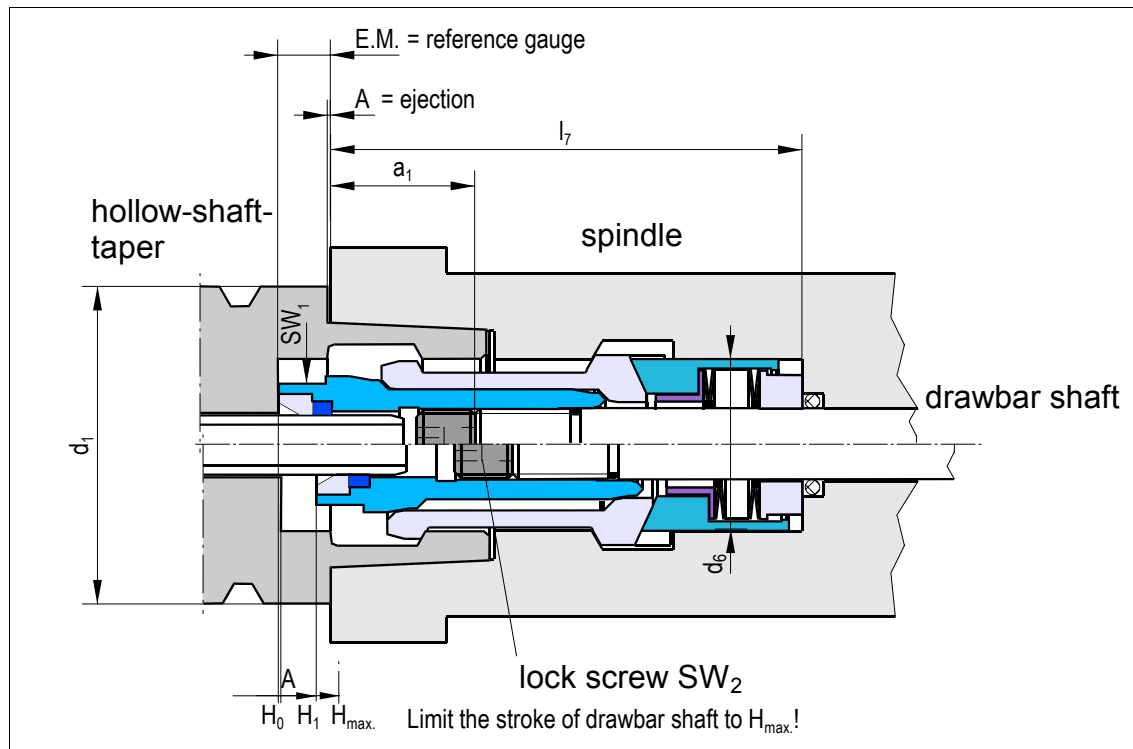


1.5.4 Table

		nominal size									mm	
		25	32	40	50	63	80	100	125	160		
tool standard	A	F _{sp}		5	6,8	11	18	28	45	70	115	
		F _{1 max.}		1,75	2,4	3,85	6	9,2	15	24,5	40	
		F _A		0,9	1,3	2,2	3,2	5,2	7	10,3	14,4	
	B	F _{sp}			5	6,8	11	18	28	45	70	
		F _{1 max.}			1,75	2,4	3,85	6,3	9,8	15,8	24,5	
		F _A			1	1,7	2,9	4,6	6,9	10	14,4	
	E	F _{sp}	2,8	5	6,8	11	18					
		F _{1 max.}	0,98	1,75	2,4	3,85	6,3					
		F _A	0,9	1,1	1,7	2,9	4,7					
	F	F _{sp}				6,8	11	18				
		F _{1 max.}				2,4	3,85	6,3				
		F _A				1,9	3,4	5,6				

1.6 Dimension

1.6.1 Clamping Unit

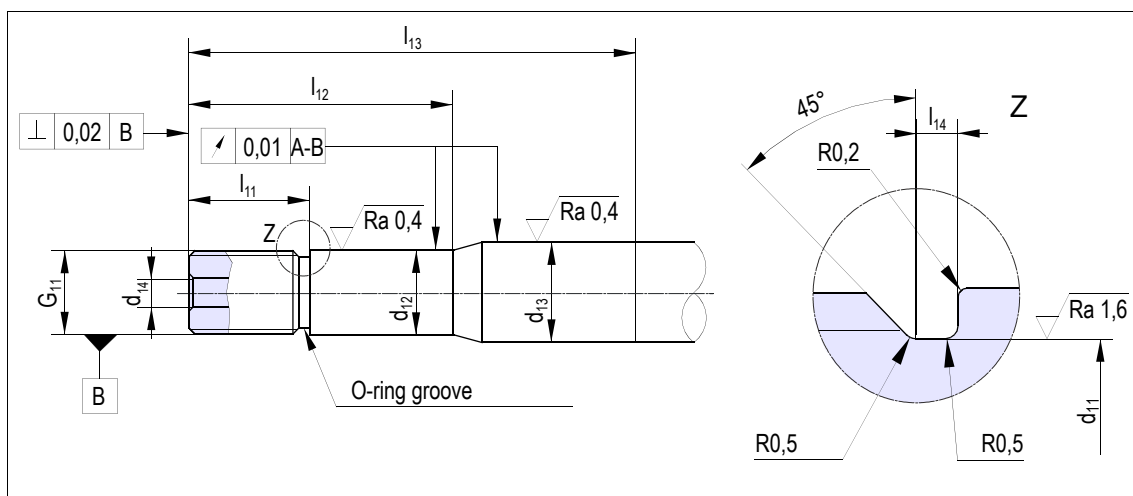


d_1 form A		32	40	50	63	80	100	125	160
d_1 form B		40	50	63	80	100	125	160	
d_1 form E	25 *	32	40	50	63				
d_1 form F			50	63	80				
[mm]	A	0,5	0,5	0,5	0,5	0,5	0,5	0,5	1
	E.M. $\pm 0,1$	6,5	8,5	8,5	10,5	10,5	13	13	16,5
	$H_{max.}$	7	7,5	8	9	10	11	12,5	15,8
	H_1	4,6	5,1	5,6	6,4	7,4	8,3	9,15	10,8
	SW ₁	10	12	15	18	22	27	36	46
	SW ₂	3	3	4	4	5	6	6	14
	a_1	5,5	19,5	27	26,5	31,5	31,5	34,5	40,5

(Information about form A / form B / form E / form F \Rightarrow 1.1 / S.4)

* without transfer

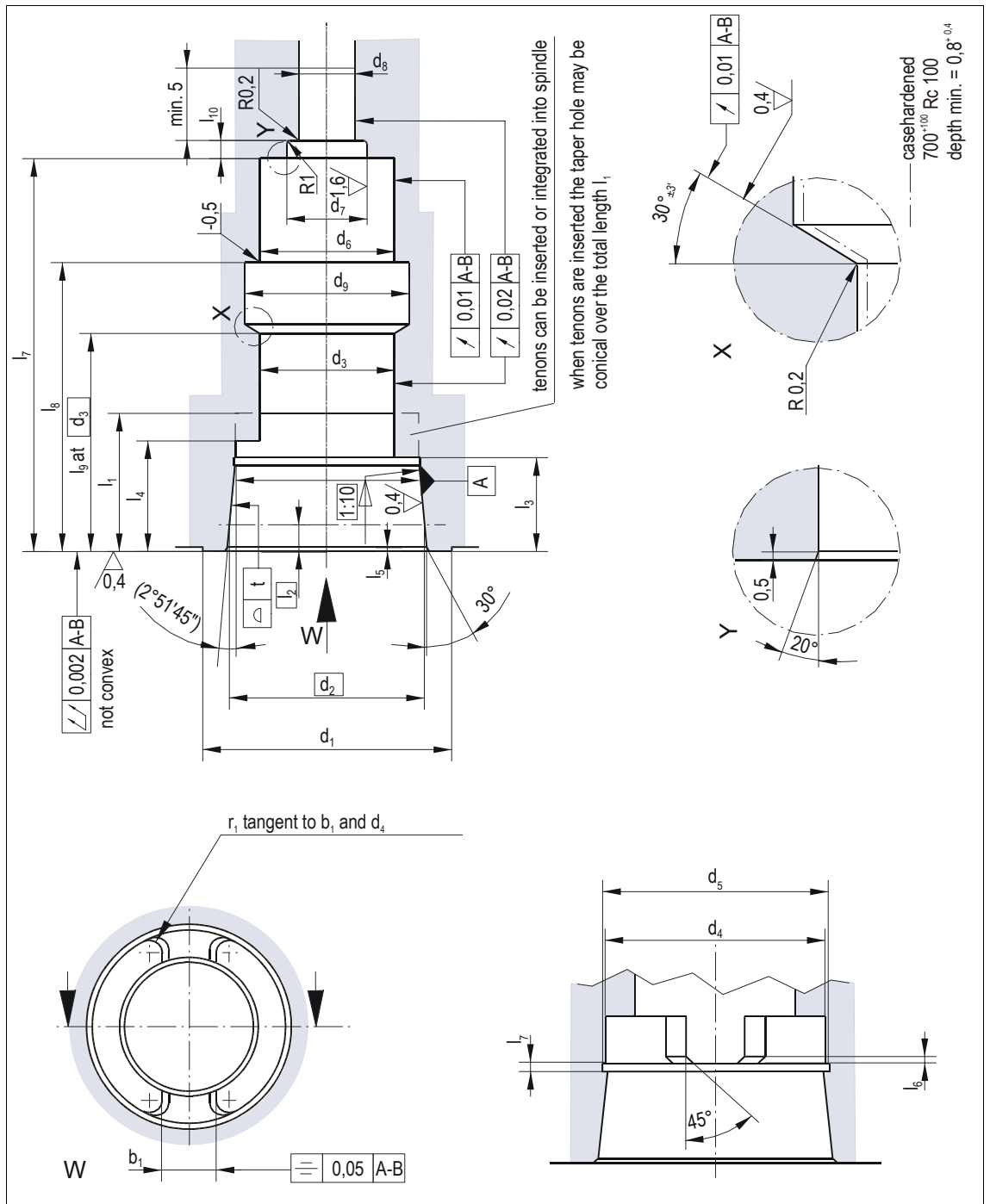
1.6.2 Drawbar



d_1 form A			32	40	50	63	80	100	125	160	
d_1 form B			40	50	63	80	100	125	160		
d_1 form E	25		32	40	50	63					
d_1 form F				50	63	80					
[mm]	d_{11}	$^{-0,1}$	4,6	4,6	6	7,9	11,9	13,9	13,9	21,2	27,1
	d_{12}		$6,2_{g7}$	$6,2_{g7}$	$8,2_{g7}$	$10,2_{g7}$	$14,2_{g7}$	$16,2_{g7}$	$16,2_{h8}$	$24,2_{h8}$	$30,4_{h8}$
	d_{13}		-	-	-	-	-	-	18_{g7}	25_{g7}	32_{g7}
	d_{14} max.		2,5	2,5	3	4	5	6	6	12	12
	G_{11}	$^{-4g}$	M6x0,5	M6	M8	M10	M14x1,5	M16x1,5	M16x1,5	M24x1,5	M30x1,5
	l_{11}		10,5	9	14	16	18,5	21,5	32	38	52
	l_{12}		45	50	60	67	76	80	50	60	75
	l_{13}		-	-	-	-	-	-	101	115	145
l_{14}		$1^{+0,1}$	$1^{+0,1}$	$1,4^{+0,1}$	$1,4^{+0,1}$	$1,4^{+0,1}$	$1,4^{+0,1}$	$1,4^{+0,1}$	$1,9^{+0,2}$	$1,9^{+0,2}$	

For information only; not a manufacturing drawing!

1.6.3 Spindle inside contour HSK form A



		d₁		32	40	50	63	80	100	125	160
ISO / CD 12164-2 *	[mm]	b₁	±0,05	6,8	7,8	10,3	12,3	15,8	19,78	24,78	29,78
		d₂		23,998	29,998	37,998	47,998	59,997	74,997	94,996	119,996
		d₃	H10	17	21	26	34	42	53	67	85
		d₄	+0,1	23,28	29,06	36,85	46,53	58,1	72,6	92,05	116,1
		d₅	+0,2	23,8	29,6	37,5	47,2	58,8	73,4	93,0	118,0
		l₁	+0,2	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	11,4	14,4	17,9	22,4	28,4	35,4	44,4	57,4
		l₄	+0,2	13,4	16,9	20,9	26,4	32,4	40,4	51,4	64,4
		l₅		0,8	0,8	1	1	1,5	1,5	2	2
		l₆	+0,1	1	1	1,5	1,5	2	2	2,5	2,5
		l₇	±0,1	2,0	2,0	2,0	2,5	3,0	3,0	4,0	4,0
		r₁	-0,05	1,5	2	2,5	3	4	5	6	8
		t **		0,0015	0,0015	0,0020	0,0020	0,0025	0,0030	0,0035	0,0035
clamping unit	[mm]	d₆	H6	17	21	26	34	42	53	67	85
		d₇	+0,1	10,3	13,2	15,2	20,4	22,4	24,2	32	37,2
		d₈	+0,1	6,6	8,6	10,6	14,6	16,6	18,4	25,4	32,4
		d₉	+0,2	22,5	26,5	33	41,6	50	63	79	104
		l₇	-0,2	62,5	78	84	94	98	124	149	188
		l₈	±0,1	43	58	61	69	72	93	112,5	148
		l₉	js8 at d ₃	30	44	45	52	56	70	86	113
		l₁₀	+0,2	3	3,6	3,6	4,2	4,2	4,2	4,7	4

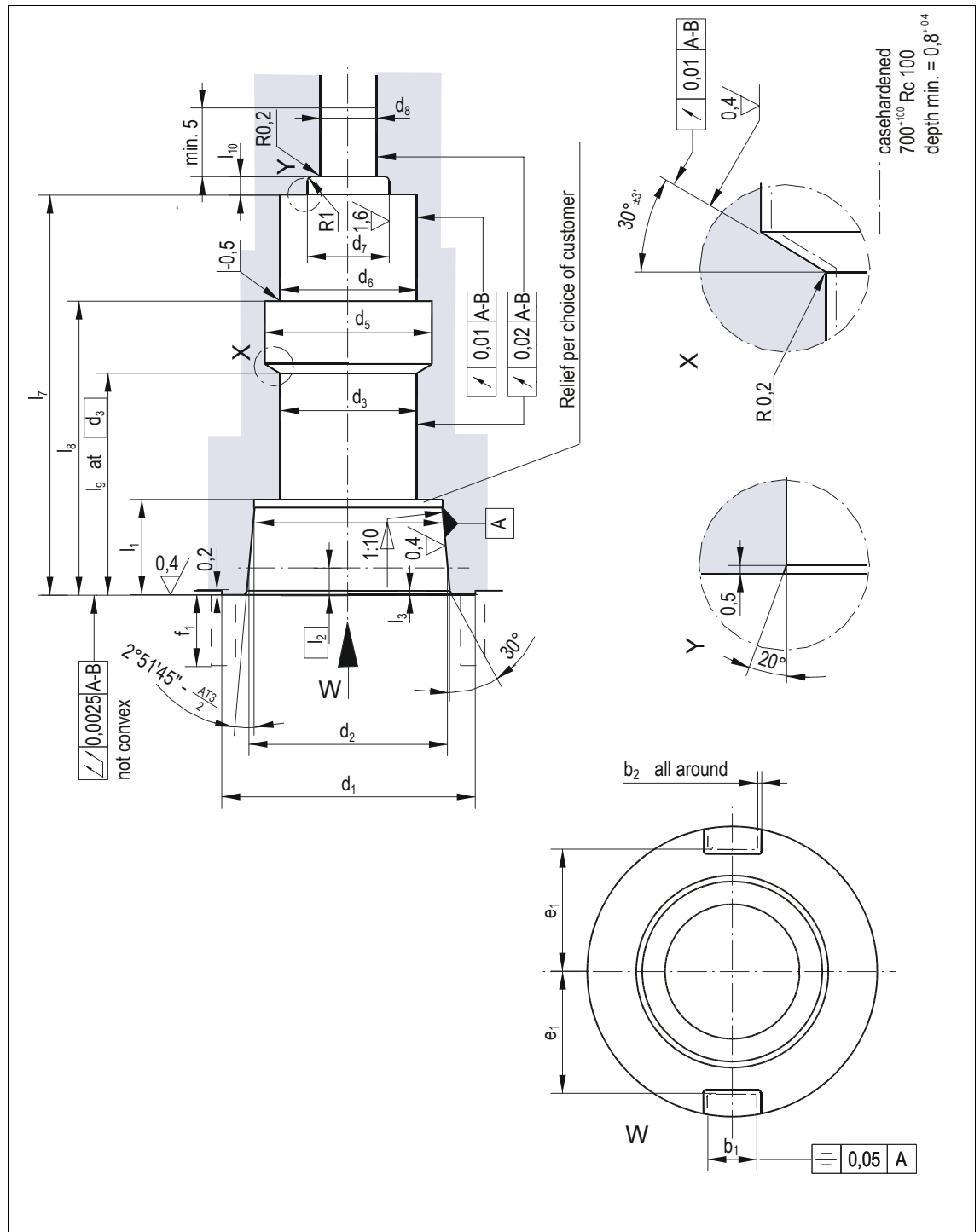
The dimensions in the clamping unit section are for spindle speeds up to 10000 rpm. For higher spindle speeds we recommend to reduce the tolerance of dimension d₈ and the runout. Please let us know if you need additional information.

* see update standard

** see ISO 1101 and ISO 3040

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1.6.4 Spindle inside contour HSK form B



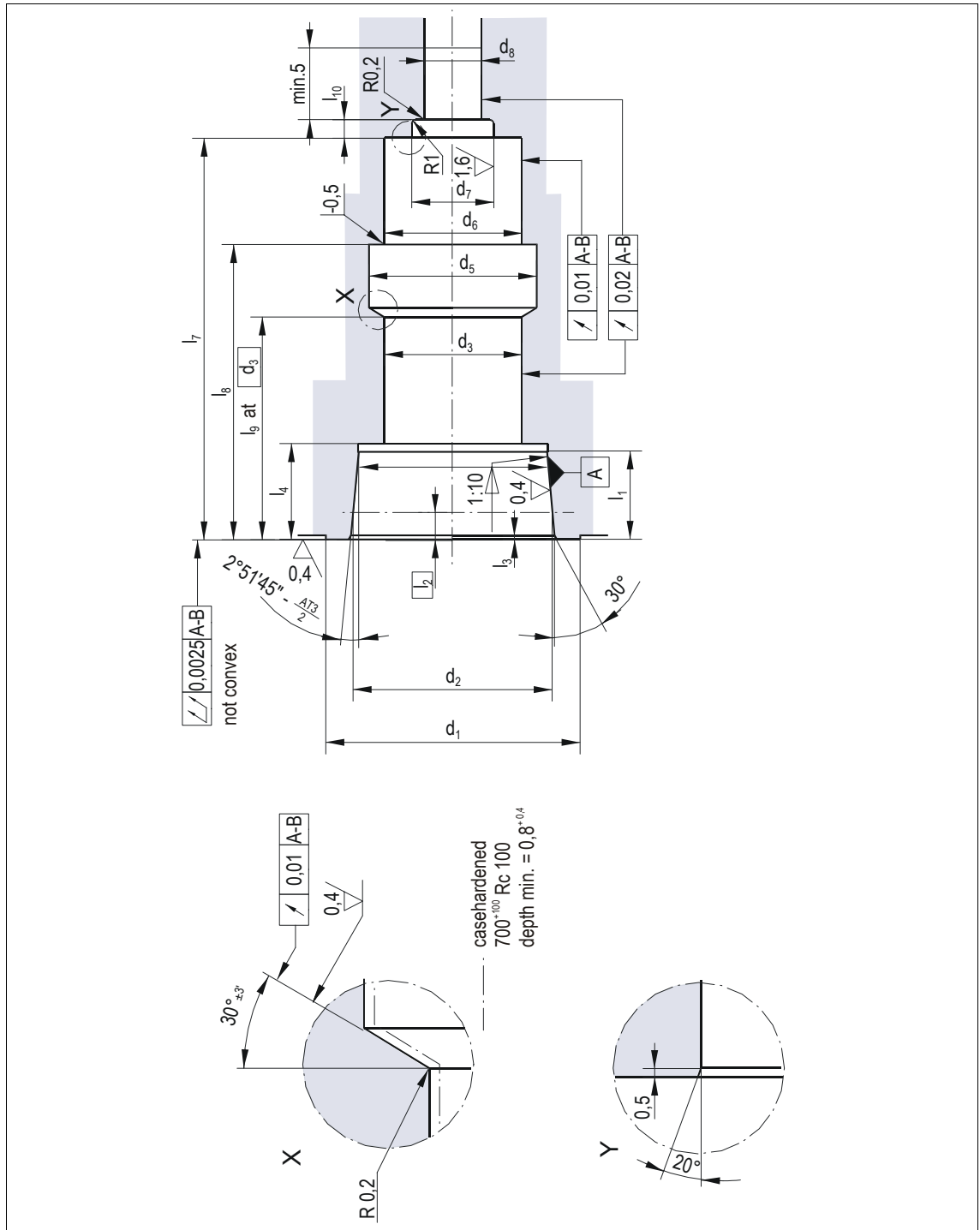
		d_1		40	50	63	80	100	125
E DIN 69063-2 1997-04*	[mm]	b_1	$+0,05$ $-0,05$	9,9	11,9	15,9	17,9	19,9	24,9
		b_2		1	1	1	1	2	2
		d_2		24	30	38	48	60	75
				0	0	0	0	0	0
				-0,003	-0,003	-0,004	-0,004	-0,005	-0,006
		d_3	H10	17	21	26	34	42	53
		e_1	$+0,2$ 0	16,2	20,2	25,2	31,7	40,2	50,2
		f_1	max.	19,5	25,5	25,5	25,5	28,5	28,5
		l_1	$+0,3$ 0	16,5	20,5	25,5	33	41	51
		l_2		3,2	4	5	6,3	8	10
l_3		0,8	0,8	1	1	1,5	1,5		
clamping unit	[mm]	d_5	+0,2	22,5	26,5	33	41,6	50	63
		d_6	H6	17	21	26	34	42	53
		d_7	+0,1	10,3	13,2	15,2	20,4	22,4	24,2
		d_8	+0,1	6,6	8,6	10,6	14,6	16,6	18,4
		l_7	-0,2	62,5	78	84	94	98	124
		l_8	$\pm 0,1$	43	58	61	69	72	93
		l_9	js8 at d_3	30	44	45	52	56	70
		l_{10}	+0,2	3	3,6	3,6	4,2	4,2	4,2

The dimensions in the clamping unit section are for spindle speeds up to 10000 rpm. For higher spindle speeds we recommend to reduce the tolerance of dimension d_8 and the runout. Please let us know if you need additional information.

- see update standard

For information only; not a manufacturing drawing!

1.6.5 Spindle inside contour HSK form E



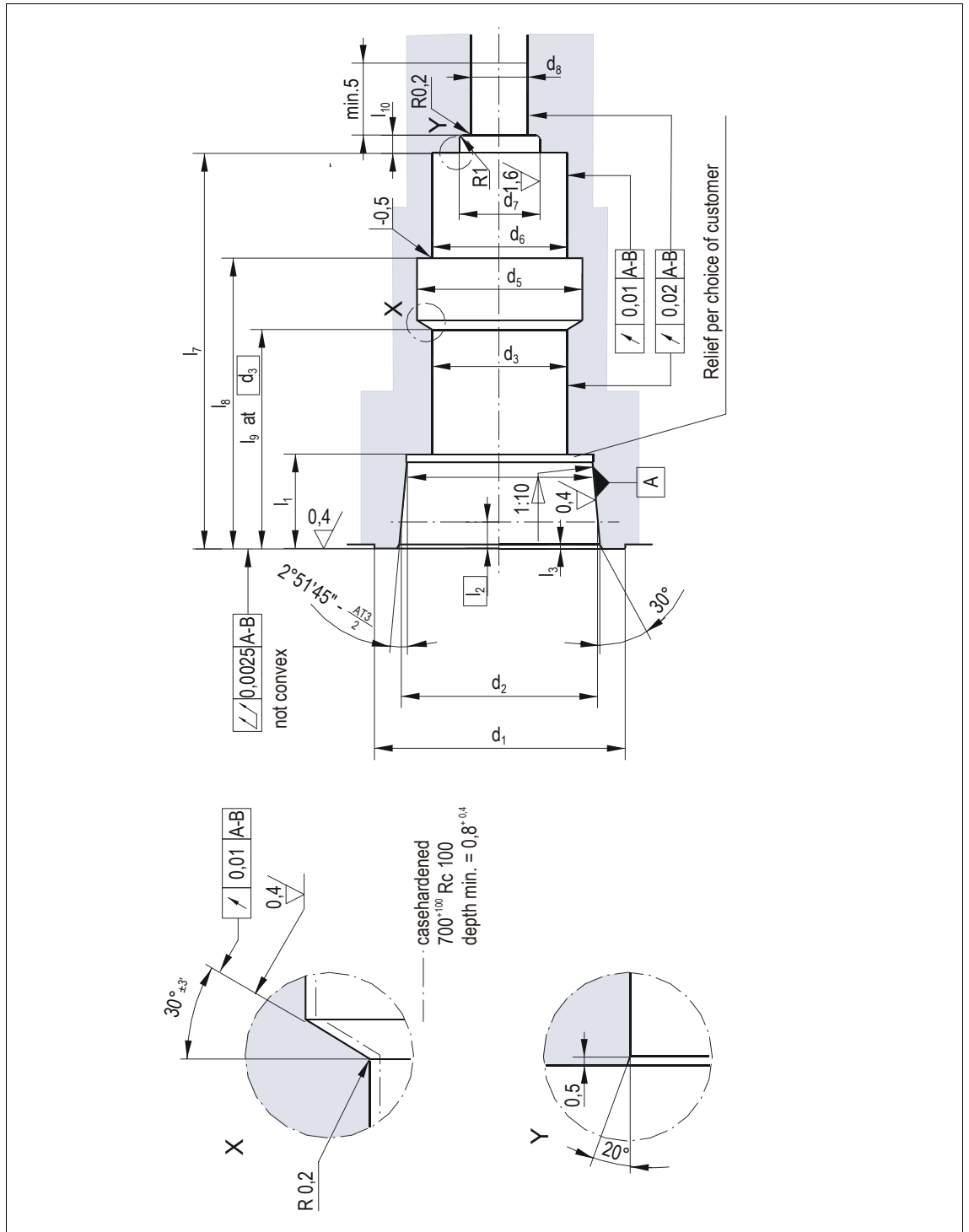
		d₁		25	32	40	50	63
DIN V 69063-5 1996-01 *	[mm]	d₂		19	24	30	38	48
				-0,001	-0,001	-0,002	-0,003	-0,003
				-0,003	-0,003	-0,004	-0,006	-0,007
		l₁		13	16	20	25	32
		l₂		2,5	3,2	4	5	6,3
		l₃		0,5	0,8	0,85	1	1
		l₄		13,5	16,5	20,5	25,5	33
clamping unit	[mm]	d₃	H10	14	17	21	26	34
		d₅	+0,2	18	22,5	26,5	33	41,6
		d₆	H6	14	17	21	26	34
		d₇	+0,1	-	10,3	13,2	15,2	20,4
		d₈	+0,1	6,4	6,6	8,6	10,6	14,6
		l₇	-0,2	40	62,5	78	84	94
		l₈	±0,1	25,5	43	58	61	69
		l₉	js8 bei d ₃	18,5	30	44	45	52
		l₁₀	+0,2	-	3	3,6	3,6	4,2

The dimensions in the clamping unit section are for spindle speeds up to 10000 rpm. For higher spindle speeds we recommend to reduce the tolerance of dimension d_8 and the runout. Please let us know if you need additional information.

- see update standard

For information only; not a manufacturing drawing!

1.6.6 Spindle inside contour HSK form F



		d_1		50	63	80
DIN V 69063-6 1996-01 *	[mm]	d_2		30	38	48
				-0,002	-0,003	-0,003
				-0,004	-0,006	-0,007
		d_3	H10	21	26	34
		l_1	+0,2	20,5	25,5	33
		l_2		4	5	6,3
		l_3	+0,2	0,8	1	1
clamping unit	[mm]	d_5	+0,2	26,5	33	41,6
		d_6	H6	21	26	34
		d_7	+0,1	13,2	15,2	20,4
		d_8	+0,1	8,6	10,6	14,6
		l_7	-0,2	78	84	94
		l_8	$\pm 0,1$	58	61	69
		l_9	js8 bei d_3	44	45	52
		l_{10}	+0,2	3,6	3,6	4,2

The dimensions in the clamping unit section are for spindle speeds up to 10000 rpm. For higher spindle speeds we recommend to reduce the tolerance of dimension d_8 and the runout. Please let us know if you need additional information.

- see update standard

For information only; not a manufacturing drawing!

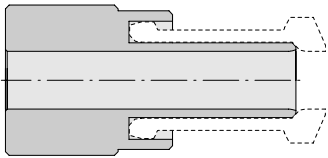
1.7 Order number

d ₁ form A	d ₁ form B	d ₁ form E	d ₁ form F	clamping unit for axial medium transfer	lock screw
32	40	32		95.600.008.3.6	95.600.121.4.1
40	50	40	50	95.600.007.3.6	95.600.122.4.1
50	63	50	63	95.600.004.3.6	95.101.597.5.1
63	80	63	80	95.600.001.3.6	95.601.475.4.1
80	100			95.600.002.3.6	95.103.636.5.1
100	125			95.600.003.3.6	95.103.636.5.1
125				95.600.009.3.6	95.600.101.4.1
160				95.600.010.3.6	95.600.372.4.1

d ₁ form A	d ₁ form B	d ₁ form E	d ₁ form F	clamping unit without medium transfer; air is possible; without picture	lock screw
		25		95.600.011.3.6	95.600.271.4.1
40	50	40	50	95.600.016.3.6	95.600.122.4.1
50	63	50	63	95.600.083.3.2	95.101.597.5.1
63	80	63	80	95.600.015.3.6	95.601.475.4.1

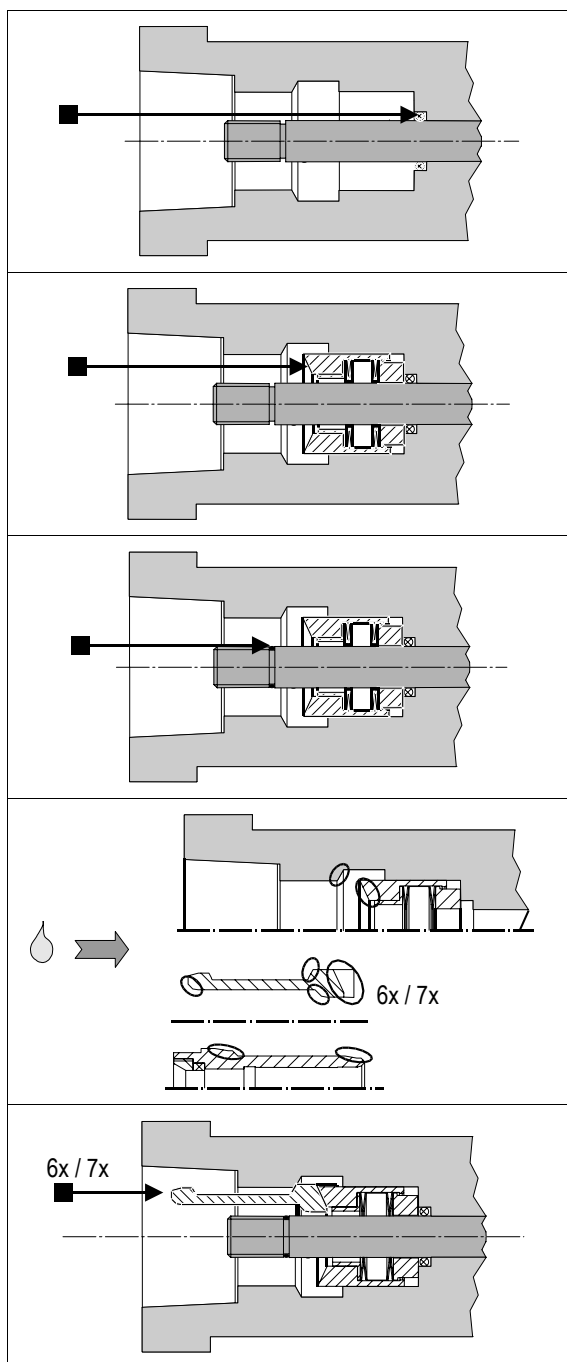
1.7.1 Assembly tool for HSK clamping unit

For easier assembly of the HSK gripper unit; not included with delivery!

	size	order-no.
	E25 (without figure)	95.601.561.3.2
	A32 / B40 / E32	95.601.111.3.1
	A40 / B50 / E40 / F50	95.601.112.3.1
	A50 / B63 / E50 / F63	95.601.113.3.1
	A63 / B80 / E63 / F80	95.601.114.3.1
	A80 / B100	95.601.115.2.1
	A100 / B125	95.601.116.2.1
	A125 / B160	95.601.117.2.1
	A160	95.601.118.2.1

2 Assembly

2.1 Clamping unit HSK



- Clean spindle inside contour
- make sure that edges are properly rounded
- grease O-rings
- mount o-ring in the spindle
- grease spacer with mounting grease
- push spacer into spindle and check for ease of movement

- mount o-ring on the drawbar

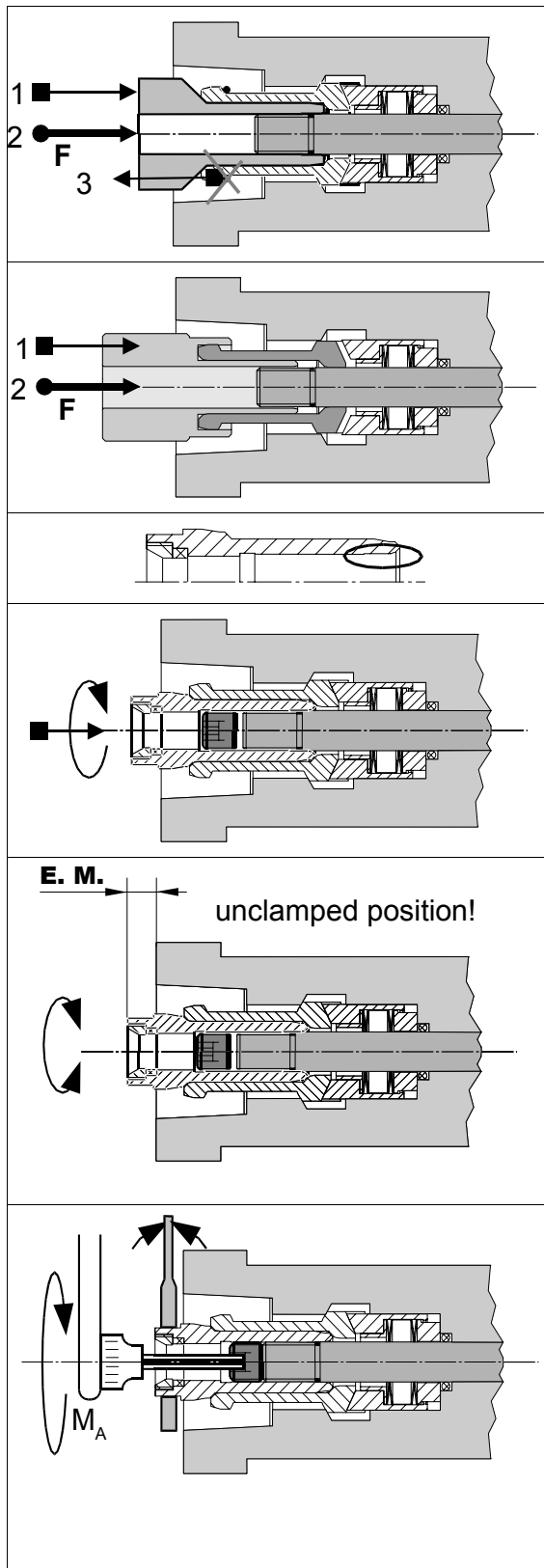
Protective sleeve obtainable:
HSK A 63: 95.601.169.4.1

- grease area of contact
- ➔ METAFLUX-Paste 70-8508
- or

➔ KLÜBER-Paste ME 31-52

do not mix the grease!

- snap gripper segments in the spacer; ensure that the numbers match



When using assembly fixture:

- assemble the segments on the fixture by using an o-ring, insert complete fixture with segments into the spindle; give it a good push until the segments click in place, remove the o-ring

alternatively:

- put the segments into the fixture; insert the complete unit; give the fixture a good push until the segments click in place
- grease clamping cone with mounting grease
- screw clamping cone (pre-assembled with seal, protective sleeve and lock screw) onto the drawbar shaft at maximum to the setting dimension; do not continue to turn since otherwise the o-ring on the drawbar shaft will be damaged!

- adjust gauge dimension E.M.

gauge dimension:

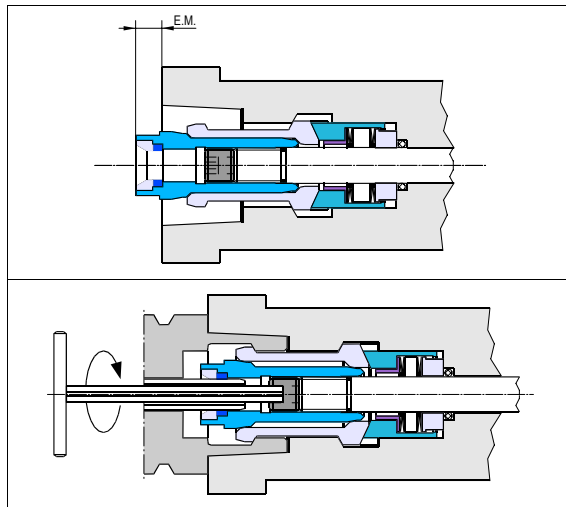
- E25: 6,5 mm
- A32 / B40 / E32: 8,5 mm
- A40 / B50 / E40 / F50: 8,5 mm
- A50 / B63 / E50/ F63: 10,5 mm
- A63 / B80 / E63 / F80: 10,5 mm
- A80 / B100: 13 mm
- A100 / B125: 13 mm
- A125 / B160: 16,5 mm

- tighten the lock screw

starting torque::

- E25: 7 Nm
- A32 / B40 / E32: 10 Nm
- A40 / B50 / E40 / F50: 15 Nm
- A50 / B63 / E50/ F63: 20 Nm
- A63 / B80 / E63 / F80: 30 Nm
- A80 / B100: 30 Nm
- A100 / B125: 50 Nm
- A125 / B160: 100 Nm
- A160: 150 Nm

2.1.1 Check after approx. 100 strokes



In unclamped position

➤ Check dimension gauge E.M.

➤ re-tighten through a clamped tool

3 Operation

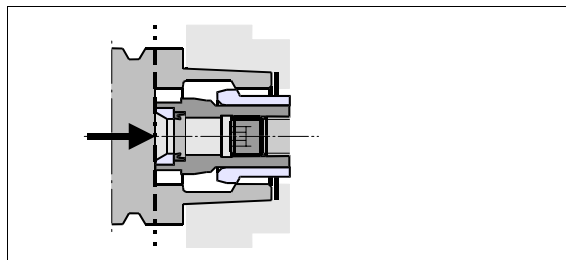


ATTENTION

No rotation without clamped tool!

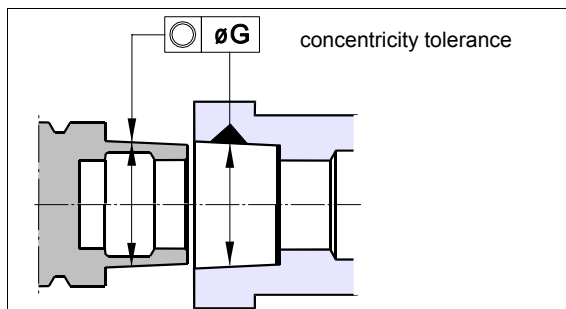


Important



Do not insert tool into the spindle taper when rotating!

The tool has to be inserted all the way to the plane surface of the clamping cone to prevent misclamping!



Our recommendation for the concentricity tolerance for tool changing as well as the maximum force on the plane surface on the clamping cone is shown in the table below:

standard size	E 25	A 32 B 40 E 32	A 40 B 50 E 40 F 50	A 50 B 63 E 50 F 63	A 63 B 80 E 63 F 80	A 80 B 100	A 100 B 125	A 125 B 160	A 160
concentricity (øG) [mm]	0,6	0,7	0,7	0,8	0,8	1,0	1,0	1,0	1,2
tool changer force max. [kN]	1	1	1,4	2,2	3,6	5,6	9	9	9

Recommendation: install a limit switch for the drawbar

In order to minimize wear, the coolant tube at the interface of the gripper assembly and tool should be shaped as follows:

- minimum and easy going and angular flexing (per ISO 12164-1)
- ground

Operation with coolant is only permitted if free flow is guaranteed. Therefore, you must only use tool holders with coolant tubes and tools with coolant thru holes. Otherwise, it is possible that the spindle gets flooded or the seals are damaged by the pressure spikes.

Follow preventive maintenance schedule!

**Important****Coolant**

Guidelines and technical specifications for the coolant use in the machine:

Die verwendeten Kühlschmiermittel müssen den aktuellen Vorschriften der Gesetzgebung und den Berufsgenossenschaften entsprechen.
Coolant use must conform to the current regulations of the legislation and the professional association.

Further more you have to use only coolant which conforms with the specs listed on the table below.

Do not use tap water. Tap water drastically reduces the pH - value and causes corrosion on the uncoated parts, which often goes unnoticed, but later causes severe corrosion damage.

Parameter / test procedure	Limited values
Corrosion protection according to DIN 51360 section 2	No corrosion after 2 hours
Elastomer compatibility	No change of the shore hardness and/or the elongation OTT-JAKOB applies FKM (VITON®)
Nonferrous metal compatibility	No corrosion on copper, brass and aluminum parts
glue residue after slow evaporation at 50 degree	Non sticky! No residue! Easily removable.

OTT JAKOB is not responsible for damages, if inappropriate coolants are used!


4 Maintenance

4.1 Preventive maintenance schedule

To guarantee the function of the power drawbar the following preventive maintenance schedule must be adhered to.

Every week

- Check the packing ring in the clamping unit (visual check)
- Check the gripper, is it damaged or dirty, is it sufficient greased (visual check) ?
Pay attention to:
The regrease cycle depends on the loss of lubrication of the clamping unit.
Cause for the loss of lubrication:
 - Seal in the clamping cone is defective
 - Type of medium used can desolve grease
 - Cleaning spray from outside directly on the clamping unit etc

Regrease clamping unit → #4.2 /  26

Every six month or after 200.000 tool changes at the latest

- In unclamped position: Check dimension gauge E.M.
- counter through a clamped tool again.
- Test Pull-in-force (we recommend:use Power-Check):
If the pull-in-force is smaller than 70% of the nominal value, following procedures have to be performed in the following sequence:
 - regrease and test pull-in force again
 - exchange gripper and test again
 - exchange drawbar completely

Every year or after 500.000 tool changes at the latest

- Exchange the packing ring → #4.4 /  28

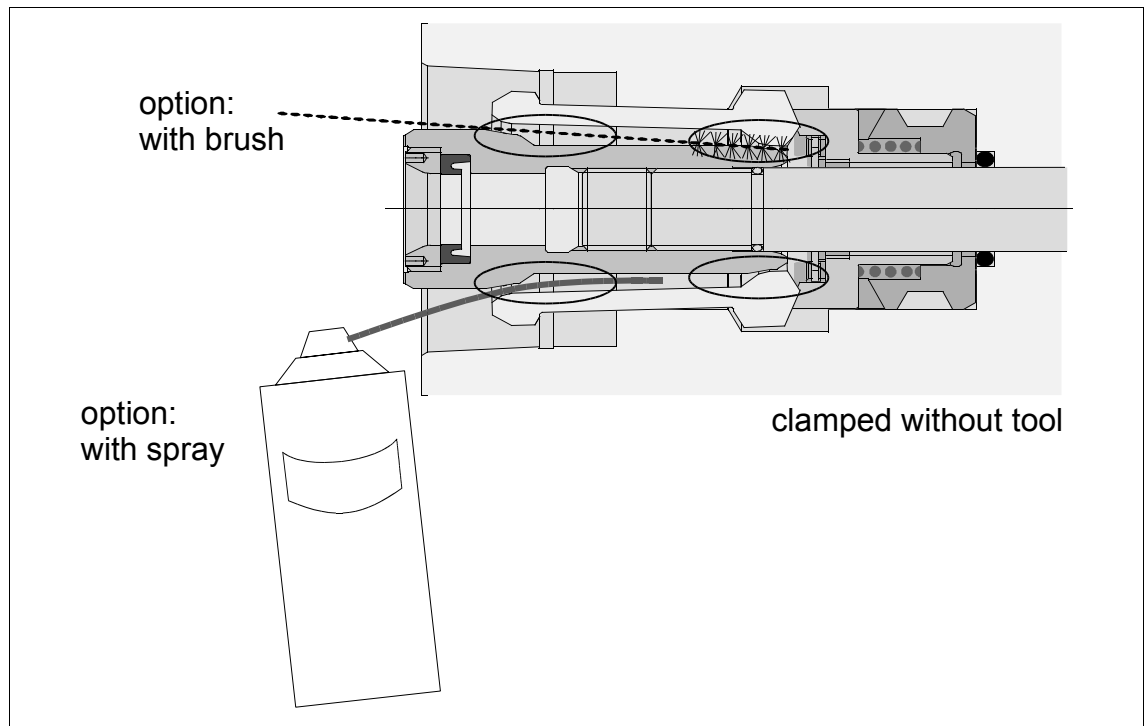
4.2 Regrease clamping unit



Important

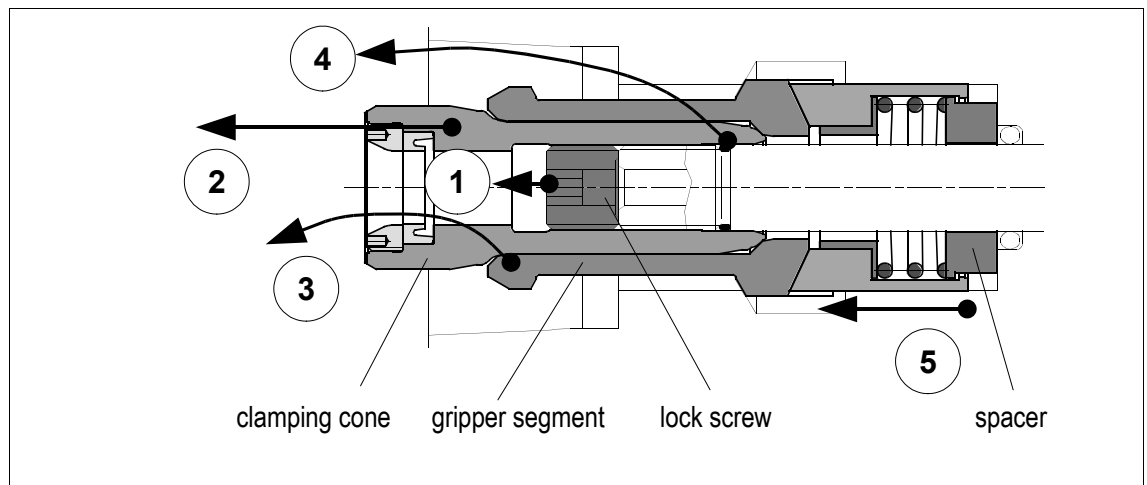
Note: take only grease of one company; do not mix the grease!

Regrease in assembled condition



If very dirty: take clamping unit out and clean.
Then grease clamping unit and reassemble → # 2.1 / 20

4.3 Disassemble clamping unit HSK

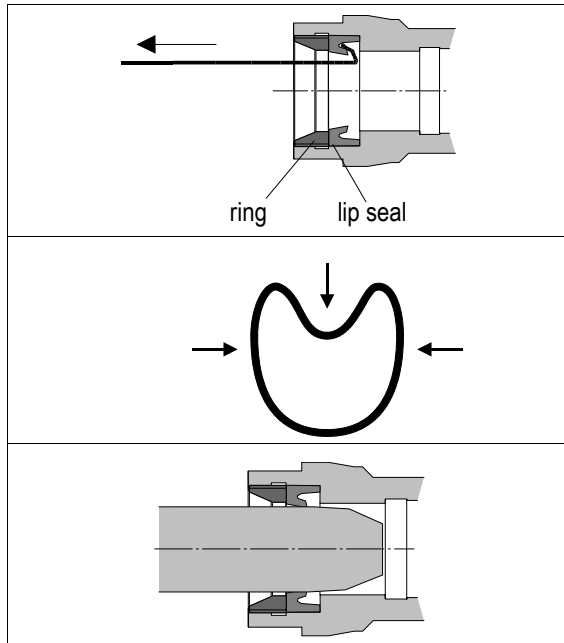


In unclamped position:

1. loosen lock screw
2. unscrew clamping cone
3. remove gripper segments with light tilting movements
4. remove O-ring from drawbar
5. remove spacer with it use 2 long nose pliers or tweezers

4.4 Exchange of the lip seal

For dismounting the lip seal it is not necessary to take away the ring.



- Take away the damaged lip seal with a hook or pliers
- Compress the lip ring and build in; look for the build in position
- press the seal with a blunt object against the lining
- take a mandrel to bring it in the finally position

4.5 Break of a gripper segment

- If one of the gripper segments should break, the complete set of grippers needs to be replaced (we recommend: replace the complete clamping unit) !

4.6 Wearing part list

4.6.1 Grease for HSK-clamping unit

<i>name</i>	<i>quantity</i>	<i>order-no.</i>
* METAFLUX-grease-paste Nr. 70-8508	4 g	0.929100.012
METAFLUX-moly-spray Nr. 70-82	400 ml	06.21001.010
KLÜBER-grease-paste ME 31-52	10 g	06.21001.014
KLÜBER-spray ALTEMP Q NB 50	400 ml	06.21001.015

* first equipment



Important

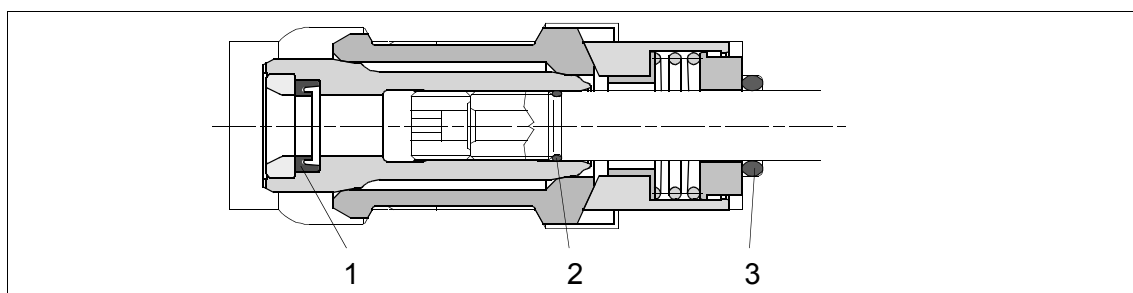
Note: take only grease of one company; do not mix the grease!

METAFLUX	Metaflux AG Industriestraße 11 CH-4313 Möhlin Tel.: +41-61-851 08 00 Fax: +41-61-851 08 08	KLÜBER	Klüber Lubrication München KG Postfach 701047 D-81310 München Tel.: (0 89) 78 76 -0 Fax: (0 89) 78 76 -333
	TECHNO-SERVICE GmbH Detmolder Straße 515 D-33605 Bielefeld Tel.: (05 21) 9 24 44 -0 Fax: (05 21) 20 74 32		

Aid for regreasing with paste in mounted state (clamped without tool):

<i>name</i>	<i>HSK-size</i>	<i>order-no.</i>
brush	A32 - A100	06.16001.001

4.6.2 O-rings and lip seal parts



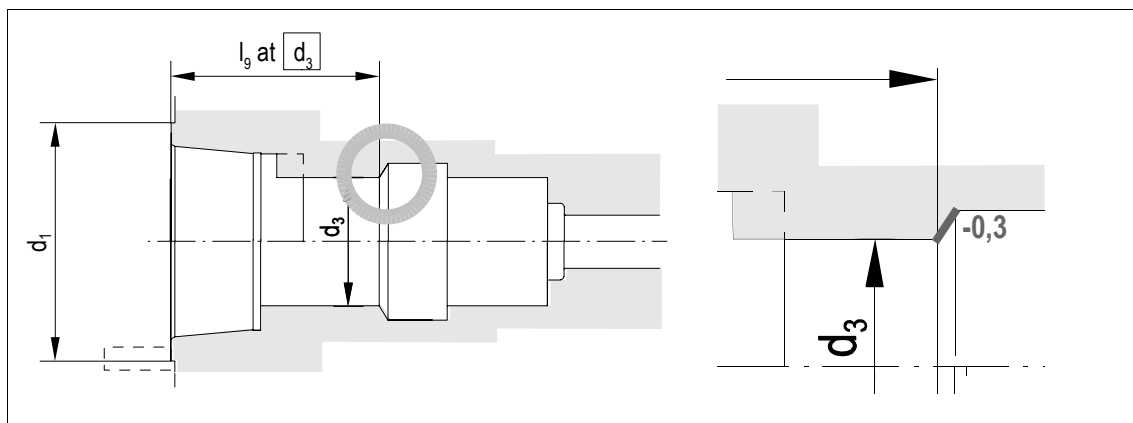
clamping unit	HSK	lip seal	O-rings	
nominal size	complete	1	2	3
E25	95.600.011.3.6	-	0.926010.166 4,5 x 1,0	-
A32 / B40 / E32	95.600.008.3.6	0.926030.110 6 x 10 x 3	0.926010.205 4,5 x 1,0	0.926010.233 6,3 x 2,4
A40 / B50 / E40	95.600.007.3.6	0.926030.112 8 x 14 x 4	0.926010.044 6,0 x 1,5	0.926010.047 8,0 x 3,0
F50	95.600.016.3.6	-	0.926010.044 6,0 x 1,5	0.926010.047 8,0 x 3,0
A50 / B63 / E50	95.600.004.3.6	0.926030.111 10 x 15 x 3,5	0.926010.170 8,0 x 1,5	0.926010.172 10,0 x 3,0
F63	95.600.083.3.2	-	0.926010.170 8,0 x 1,5	0.926010.172 10,0 x 3,0
A63 / B80 / E63	95.600.001.3.6	0.926030.103 12 x 18,5 x 4,5	0.926010.156 12,0 x 1,5	0.926010.164 13,87 x 3,53
F80	95.600.015.3.6	-	0.926010.156 12,0 x 1,5	0.926010.164 13,87 x 3,53
A80 / B100	95.600.002.3.6	0.926030.108 14 x 20 x 4,8	0.926010.167 14,0 x 1,5	0.926010.173 16,0 x 3,5
A100 / B125	95.600.003.3.6	0.926030.109 16 x 24 x 5,5	0.926010.167 14,0 x 1,5	0.926010.169 18,0 x 3,5
A125 / B160	95.600.009.3.6	0.926030.114 18 x 26 x 5,5	0.926010.145 20,0 x 2,0	0.926010.124 25,0 x 4,0

material: Viton. hardness 80 SHORE A

4.6.3 Repair clamping unit HSK B-E

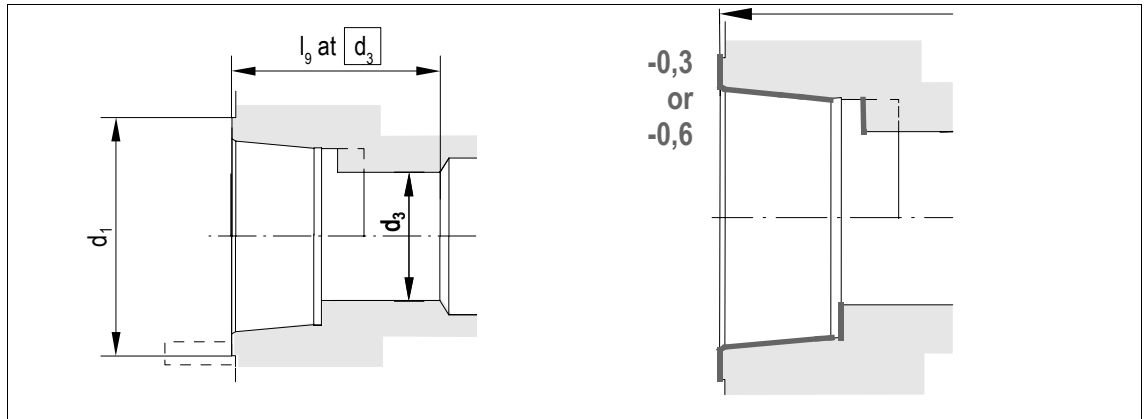
If fashioning necessary, we have repair-clamping-units.

Fashioning edge



nominal size	clamping-unit HSK		repair-clamping-unit HSK B-E1	
	complete	l_9	complete	l_9
E25	95.600.011.3.6	18,5	95.600.120.9.6	18,2
A32 / B40 / E32	95.600.008.3.6	30	95.600.121.9.6	29,7
A40 / B50 / E40	95.600.007.3.6	44	95.600.122.9.6	43,7
F50	95.600.016.3.6	44	95.600.122.9.6	43,7
A50 / B63 / E50	95.600.004.3.6	45	95.600.123.9.6	44,7
F63	95.600.083.3.6	45	95.600.123.9.6	44,7
A63 / B80 / E63	95.600.001.3.6	52	95.600.124.9.6	51,7
F80	95.600.015.3.6	52	95.600.124.9.6	51,7
A80 / B100	95.600.002.3.6	56	95.600.125.9.6	55,7
A100 / B125	95.600.003.3.6	70	95.600.126.9.6	69,7

Fashioning receiver



nominal size	clamping-unit HSK		repair-clamping-unit HSK B-E 0,3		repair-clamping-unit HSK B-E 0,6	
	complete	l_9	complete	l_9	complete	l_9
E25	95.600.011.3.6	18,5	95.600.071.9.6	18,2	95.600.087.9.6	17,9
A32 / B40 / E32	95.600.008.3.6	30	95.600.072.9.6	29,7	95.600.088.9.6	29,4
A40 / B50 / E40	95.600.007.3.6	44	95.600.073.9.6	43,7	95.600.090.9.6	43,4
F50	95.600.016.3.6	44	95.600.073.9.6	43,7	95.600.090.9.6	43,4
A50 / B63 / E50	95.600.004.3.6	45	95.600.074.9.6	44,7	95.600.091.9.6	44,4
F63	95.600.083.3.6	45	95.600.074.9.6	44,7	95.600.091.9.6	44,4
A63 / B80 / E63	95.600.001.3.6	52	95.600.075.9.6	51,7	95.600.095.9.6	51,4
F80	95.600.015.3.6	52	95.600.075.9.6	51,7	95.600.095.9.6	51,4
A80 / B100	95.600.002.3.6	56	95.600.076.9.6	55,7	95.600.096.9.6	55,4
A100 / B125	95.600.003.3.6	70	95.600.077.9.6	69,7	95.600.097.9.6	69,4

4.7 Trouble shooting HSK

trouble	reason
tool is not pulled in correctly:	gage dimension out of adjustment
	lock screw got loose
	wrong or faulty spindle-inside-contour
	wrong or faulty tool-inside-contour
	spring stack broken (travel not sufficient)
	wear of clamping unit
	tool feed not correct
	air blow off prevents tool from seating during tool change
tool is pulled out during work cycle:	gripper segments, clamping cone or drawbar broken
	tool shank broken
	springs broken
	pull-in force not sufficient
Loss of pull force:	lack of lubrication on clamping set
recommendation: check pull-in force!	