FAHRION
PRÄZISION

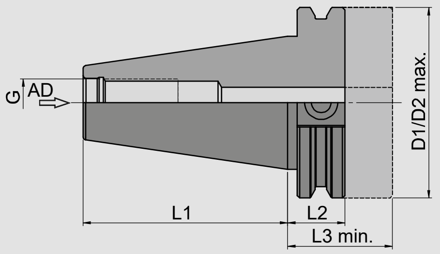
AND ALL RUNS SMOOTHLY – 111 YEARS EXPERIENCE

CENTRO|P premium
CLAMPING SYSTEMS FROM FAHRION

HORN

TECHNICAL SECTION

TAPER OVERVIEW



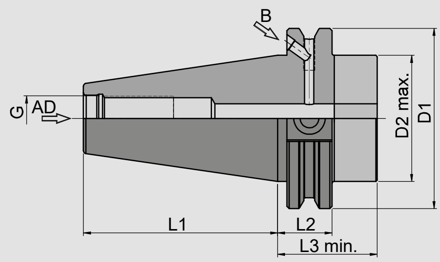
Stock material, hardened, and ground
Surface hardness: 60-2 HRC
Minimum core tensile strength: 950 N/mm²
Taper angle tolerance AT3

Taper Shanks ASME B5.50-2009/2015 - CAT

CAT	D1	D2 max.	L1	L2	L3 min.	G
40	63,5	63,5	68,30	18,58	35	UNC5/8"-11
50	96,88	96,88	101,6	19,10	35	UNC1"-8

Dimensions are in mm

CAT for **automatic** tool change.
Coolant supply AD is standard, AD/B on request!
RFID Chip Holes – on request!
Chucks produced to ASME B5.50-2009/2015 may have interference with tool changer on machines manufactured to an older standard. Please verify your machine requirements before ordering.
All chucks in this catalog are manufactured to ASME B5.50-2009/2015!



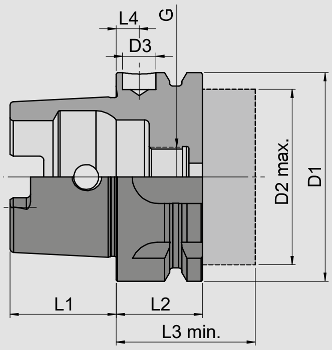
Stock material, hardened, and ground
Surface hardness: 60-2 HRC
Minimum core tensile strength: 950 N/mm²
Taper angle tolerance AT3

Taper Shanks ASME B5.50-1994 - CAT

CAT	D1	D2 max.	L1	L2	L3 min.	G
40	63,5	44,45	68,30	18,58	35	UNC5/8"-11
50	96,88	69,85	101,6	19,10	35	UNC1"-8

Dimensions are in mm

CAT for **automatic** tool change.
Coolant supply AD is standard, AD/B on request!
RFID Chip Holes – on request!
Chucks to old norm ASME B5.50-1994 are available on special request!



Case-hardened material, hardened and ground
Surface hardness: 58-2 HRC
Minimum core tensile strength: 1,000 N/mm²

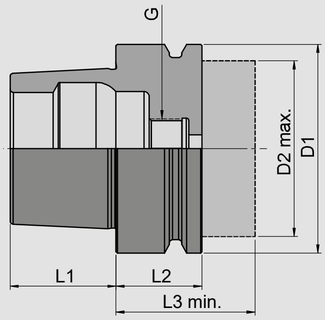
Hollow Tapers DIN 69893-1/ISO 12164-1 – HSK-A

HSK-	D1	D2 max.	D3	L1	L2	L3 min.	L4	G
A32	32	26	10	16	20	35	7	M10x1
A40	40	34	-	20	20	35	-	M12x1
A50	50	42	-	25	26	42	-	M16x1
A63	63	53	10	32	26	42	7	M18x1
A80	80	68	10	40	26	42	7	M20x1,5
A100	100	88	10	50	29	45	7	M24x1,5
A125	125	111	10	63	29	45	7	M30x1,5
A160	160	144	10	80	31	47	7	M35x1,5

HSK-A32 to HSK-A63 and A100 in this catalogue – others on request

Dimensions are in mm

For **automatic** tool change with gripping and indexing groove.
Manual operation possible through an access hole in the taper, e.g. HSK-A is compatible with interface HSK-C (**manual tool change**).
Torque is transferred by drive slots and the taper.
RFID Chip Holes – standard from range HSK-A63 onwards.



Case-hardened material, hardened and ground
Surface hardness: 58-2 HRC
Minimum core tensile strength: 1,000 N/mm²

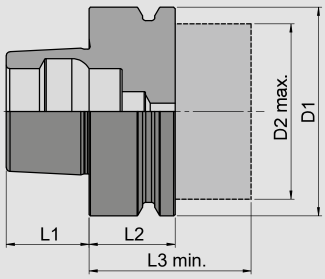
Hollow Tapers DIN 69893-5 – HSK-E

HSK-	D1	D2 max.	L1	L2	L3 min.	G
E25	25	20	13	10	20	M8x1
E32	32	26	16	20	35	M10x1
E40	40	34	20	20	35	M12x1
E50	50	42	25	26	42	M16x1
E63	63	53	32	26	42	M18x1

HSK-E25 to E50 in this catalogue – others on request

Dimensions are in mm

For **automatic** tool change.
Manual confirmation is **not** possible because no access hole exists in the cone.
Torque is transferred by the taper



Case-hardened material, hardened and ground
Surface hardness: 58-2 HRC
Minimum core tensile strength: 1,000 N/mm²

Hollow Tapers DIN 69893-6 – HSK-F

HSK-	D1	D2 max.	L1	L2	L3 min.
F50	50	42	25	26	42
F63	63	53	32	26	42

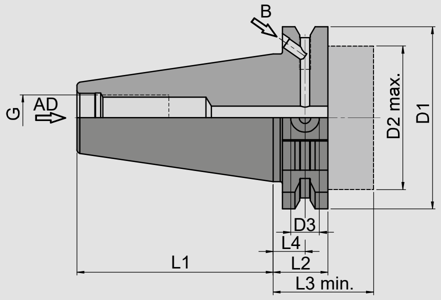
HSK-F50 to F63 in this catalogue

Dimensions are in mm

For **automatic** tool change.
Manual confirmation is **not** possible because no access hole exists in the cone.
Torque is transferred by the taper

HSK Form B, C and D are not common, but available on request.

TAPER OVERVIEW



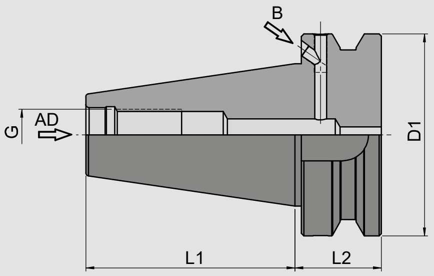
Case-hardened material, hardened and ground
Surface hardness: 60-2 HRC
Minimum core tensile strength: 950 N/mm²
Taper angle tolerance AT3

Taper Shanks DIN 69871-1 (DIN ISO 7388-1) – SK

SK	D1	D2 max.	D3	L1	L2	L3 min.	L4	G
30	50	45	10	47,8	19,1	35	11,1	M12
40	63,55	50	10	68,4	19,1	35	11,1	M16
50	97,5	80	10	101,75	19,1	35	11,1	M24
SK30 to SK50 in this catalogue								

Dimensions are in mm

For **automatic** tool change.
Coolant supply AD (AD) and / or AD/B (B).
RFID Chip Holes – standard with SK40 and SK50.



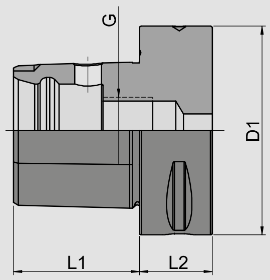
Case-hardened material, hardened and ground
Surface hardness: 60-2 HRC
Minimum core tensile strength: 950 N/mm²
Taper angle tolerance AT3

Taper Shanks JIS B 6339 (DIN ISO 7388-2) – BT/BTP

BT/BTP	D1	L1	L2	G
30	46	48,4	22	M12
40	63	65,4	27	M16
50	100	101,8	38	M24
BT/BTP30 to BT/BTP50 in this catalogue				

Dimensions are in mm

For **automatic** tool change.
Coolant supply AD (BT) and / or AD/B (BTB).
RFID Chip Holes – on request!



Case-hardened material, hardened and ground
Surface hardness: 60-2 HRC
Minimum core tensile strength: 950 N/mm²

Polygonal Shank ISO 26623-1 – PSC

PSC	D1	L1	L2	G
32	32	19	15	M12x1,5
40	40	24	20	M14x1,5
50	50	30	20	M16x1,5
63	63	38	22	M20x2
80	80	48	30	M20x2
PSC50 to PSC80 in this catalogue – others on request				

Dimensions are in mm

For **automatic** tool change.
RFID Chip Holes – on request!

EXPLANATIONS

All items with a bold item number are in stock. All other items are available either from stock or at short notice.

All products with this symbol are protected with FAHRION | Protect

Concentricity
Measured at 3 x D overhang

BALANCING

Explanations to our Balancing Information

Imbalance
- Rotor centre of gravity **2** is outside its rotational axis **1** (=offset e **3**)

Causes
- Unsymmetrical bores and milling at the tool holder (e.g. bei taper shanks DIN ISO 7388-1 (so far DIN 69871) and DIN 69893/ISO 12164 HSK form A and B)
- Unsymmetrical shape of the tool (e.g. clamping surface at the milling cutter)
- Production tolerances (runout)
- Spindle runout

Consequences
Centrifugal forces cause vibrations. These cause:
- Damage to the spindle bearings
- Mediocre surface quality
- Insufficient repeatability of accuracy
- Reduction in tool life
- Noise

Requirements
Balancing is necessary whenever optimum working conditions have to be achieved e.g.:
- Surface quality
- Production accuracies
- Tool operational life
- or if prescribed by the machine tool manufacturer (warranty claims!)

However, it is only economically sensible to balance at speeds of 8,000 rpm or higher. At speeds lower than this the cutting forces are as a rule greater than the imbalance forces.

Balancing means – determining the centre of gravity axis and moving it back to the axis of rotation.

What Balance Grade
Our CENTRO|P precision collet chucks are fine balanced as standard.

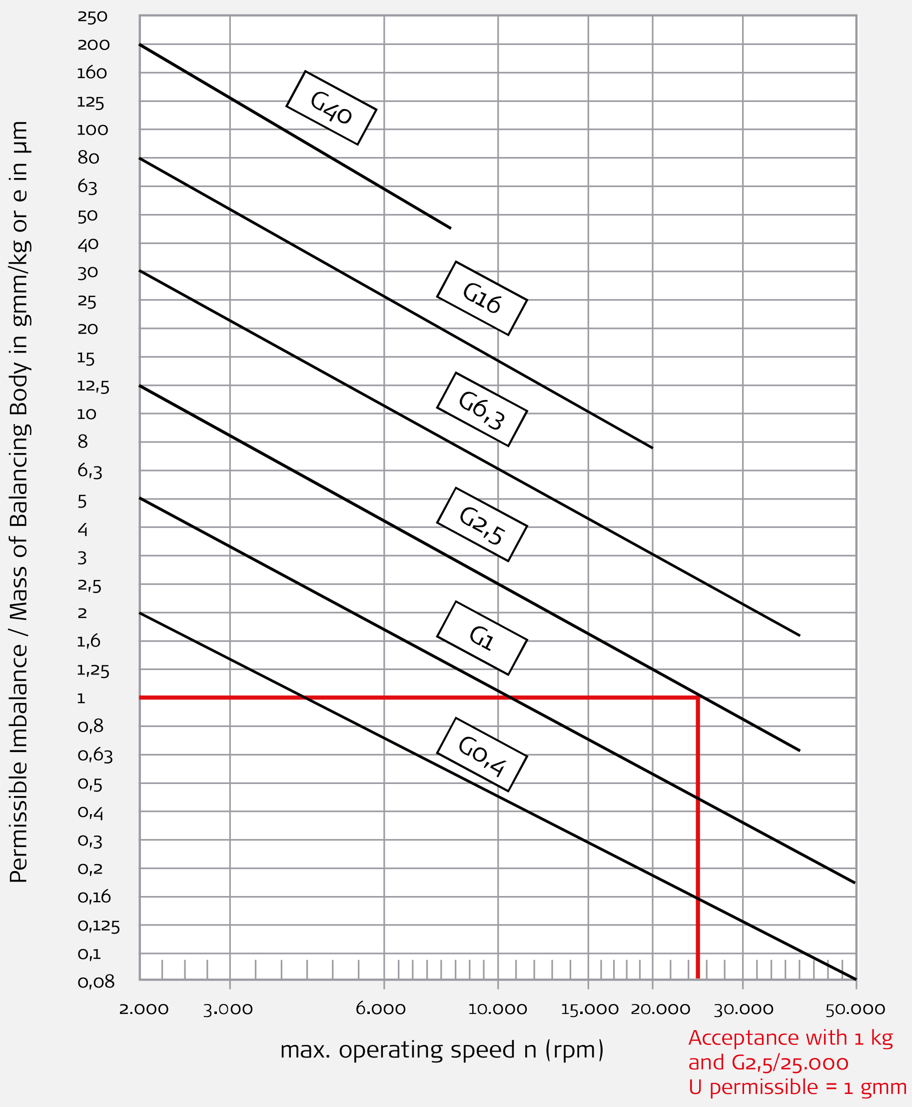
Limits to Balancing Grade
According to ISO standard 1940, the balancing standard is described using G. The balancing standard G corresponds to g/mmkg or µm and is in relation to the speed.

As an explanation: At a speed of 9,500 rpm and a weight of 1 kg G2,5 means a permissible offset between the rotational axis and the centre of gravity axis of the spindle of 2.5 µm. At a speed of 19,000 rpm it would be 1.25 µm and at 38,000 rpm 0.625 µm. If the tool holder together with the tool weighs half the amount, i.e. 0.5 kg, the balance will also be halved.

Until now, so as to minimise guarantee claims the machine or spindle manufacturers demanded such excessively fine balancing that their demands could only be met by balancing the chuck and the cutter on the machine spindle.

In order to avoid the high economic costs this caused, draft standard DIN 69888 covering balancing requirements on rotating tool systems was agreed jointly by the machine, spindle, balancing machine and tool manufacturers. The standard is a sensible solution in both technical and economic terms, since in that norm all residual imbalances are indicated in „gmm“ and **not** assigned to a balance grade. Moreover, possible tool change faults are considered.

Technology



Grade steps to DIN ISO 1940-1

Permissible residual imbalances in relation to the balancing body weight for different grade steps G depending on the highest operating speed

General Formula

$$G = e \times \omega = \frac{U}{m_R} \times \frac{2 \times \pi \times n}{60} = \frac{U \times \pi \times n}{m_R \times 30}$$

then $$U = \frac{G \times m_R \times 30}{\pi \times n}$$

G = Balancing grade step	[mm/s]
e = Centre of gravity concentricity, related imbalance	[gmm/kg or µm]
n = Speed	[rpm]
U = Imbalance	[gmm]
ω = Angular velocity	[1/sec]
m_R = Weight of the tool or the rotor	[g]

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BALANCING

Explanations to our Balancing Information

Calculation of the Total Balancing Grade
of the assembled system (spindle • tool holder • tool)

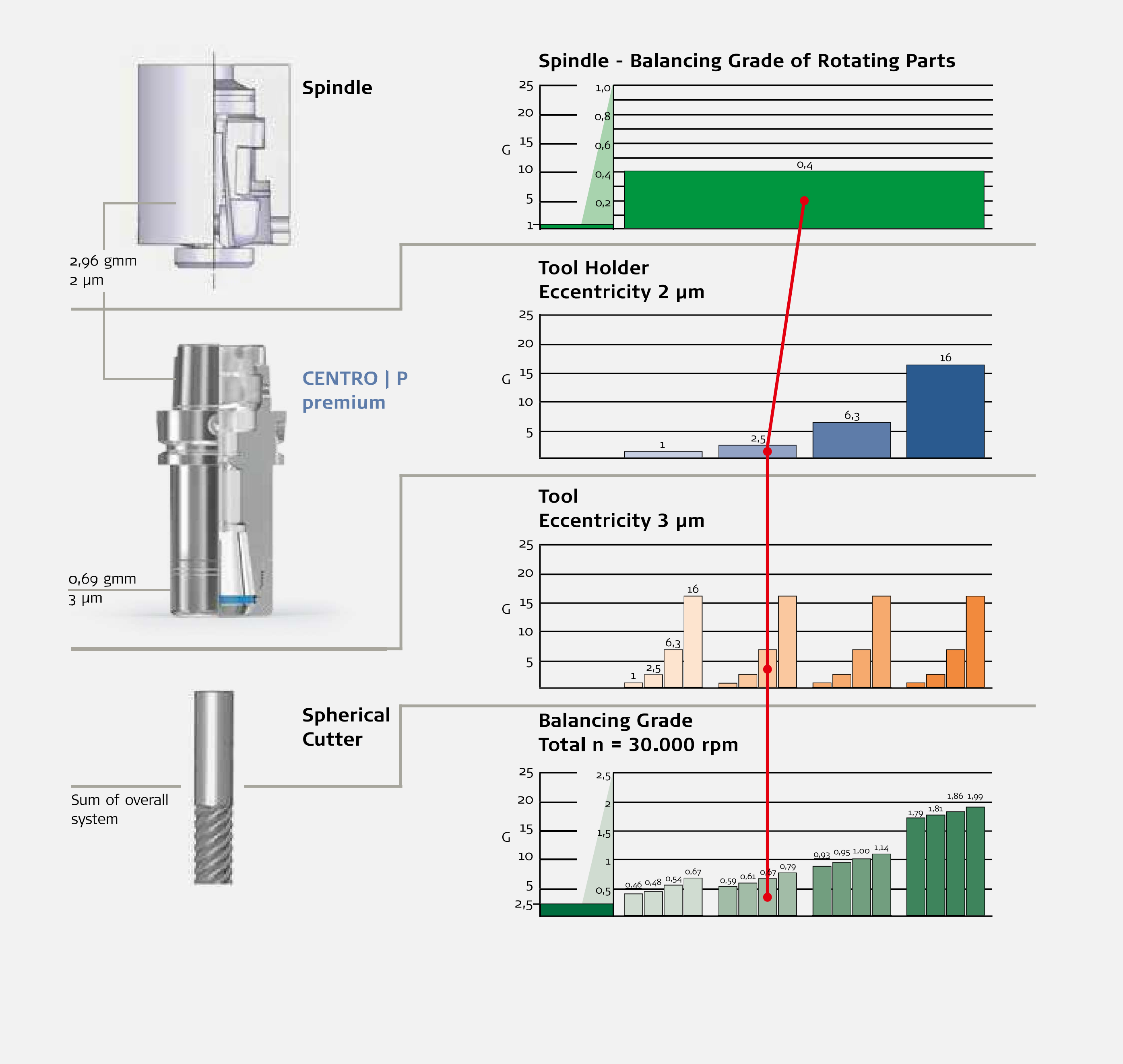

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Illustration of Balancing Grade Total

$$U_{total} = U_{Spindle} + U_{Tool\ holder} + U_{Tool}$$

Example

$$U_{total} = U_{Spindle\ (G\ 0,4)} + U_{Tool\ holder\ (G2,5)} + U_{Tool\ (G6,3)}$$

Calculation of Eccentricity

$$U = \frac{G \times 60}{2 \times \pi \times n} \times m$$

			m in g		U in gmm
$U_{Spindle}$	=	$\frac{0,4 \times 60}{2 \times \pi \times 30.000}$ x	15.000	=	1,910
$U_{Tool\ holder}$	=	$\frac{2,5 \times 60}{2 \times \pi \times 30.000}$ x	1.487	=	1,176
U_{Tool}	=	$\frac{6,3 \times 60}{2 \times \pi \times 30.000}$ x	230	=	0,461
			16.708		3,547
			m_{total} in g		U_{total} in gmm

Balancing grade conversion of the total system

$$G = U_{total} \times 2 \times \pi \times \frac{n}{60 \times m_{total}}$$

Example

$$G = 3{,}547_{gmm} \times 2 \times \pi \times \frac{30.000 \times rpm}{60s \times 16.708g} = 0{,}67$$

Calculation scheme with kind permission of Gühring oHG, Albstadt

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