Technical Publication

Diesel Engine
12V2000 G02
16V2000 G02

Tolerances and
Wear Limits List
MR70039/00E

Version
535.923-34
536.923-34

DETROIT DIESEL

mtu

DaimlerChrysler Off-Highway

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Salvo alterações.

Contents

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General Information

The tolerances and wear limits are intended as a guide for the examination of engine components during inspection and repair.

Explanation of terms for dimensions of new components	
Toleranced size	Designed size followed by a letter/number symbol (e.g. 24 ^{H6}) or by the permissible dimensional deviation (e.g. 24 $^{+0.013}$)
Basic size	Designed size without fit symbol or quotation of dimensional deviation
Deviation	Permissible deviation from the basic or toleranced size, indicated by the upper and lower limits
Clearance	Difference between bore and shaft diameters when bore diameter is greater than shaft diameter
Interference	Difference between bore and shaft diameters when bore diameter is smaller than shaft diameter

Explanation of terms for reconditioning and operational limits	
Wear limit	The limit dimensions specified do not represent the absolute maximum values permissible for satisfactory engine operation. They indicate that the next basic overhaul can be reached safely. If a limit value is exceeded, the component must be replaced.
Reconditioning instructions	If values exceed or drop below limit values, the components must be reconditioned in accordance with the relevant reconditioning instructions or replaced.

Deviations from roundness, cylindricity, parallelism and coaxiality must be within specified limit values, unless exceptions are specifically indicated.

All dimensions are given in "mm", unless alternative units of measurement are specifically indicated.

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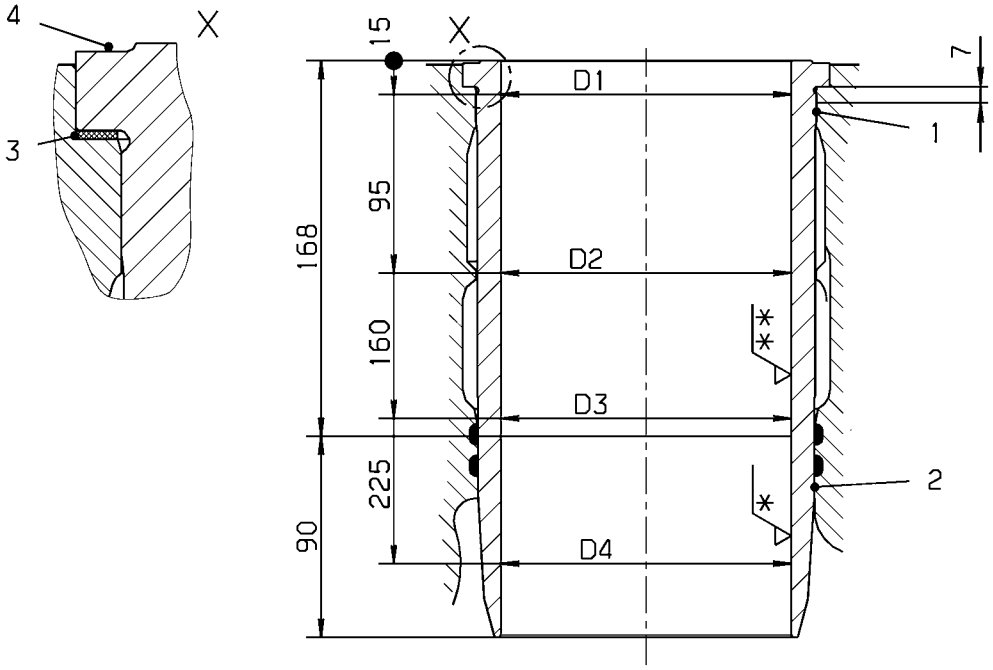
Cylinder Liner



K 010 2001 c0

No.	Designation	Stage	Tol. size	Deviation		Clearance		Interference		Wear limit
			Basic size	lower	upper	min.	max.	min.	max.	
1	Housing bore - upper fit	0 1	152.000 H7 152.500 H7	0	+ 0.040	0.007	0.071			152.070 152.570
	Cylinder liner - upper fit	0 1	152.000 152.500	- 0.031	- 0.007					
2	Housing bore - lower fit	0 1	150.000 H7 150.500 H7	0	+ 0.040	0.025	0.089			150.054 150.554
	Cylinder liner - lower fit	0 1	150.000 150.500	- 0.049	- 0.025					
3	Housing bore		164.200 H9	0	+ 0.100	0.400	0.700			164.700
	Gasket OD		163.700	- 0.100	+ 0.100					
4	Tol. size letter engraved here									
D1	Cylinder liner - measuring level		B	129.995	130.005					
D2	Cylinder liner - measuring level		B	129.995	130.005					
D3	Cylinder liner - measuring level		B	129.995	130.005					
D4	Cylinder liner - measuring level		B	130.011	130.021					

Note:
Re 1: Housing bore: Wear limit approx. 7 mm deep permissible.

* honed as per MBN37800-A

** honed as per MBN37800-A and brush-honed as per MBN10135-A

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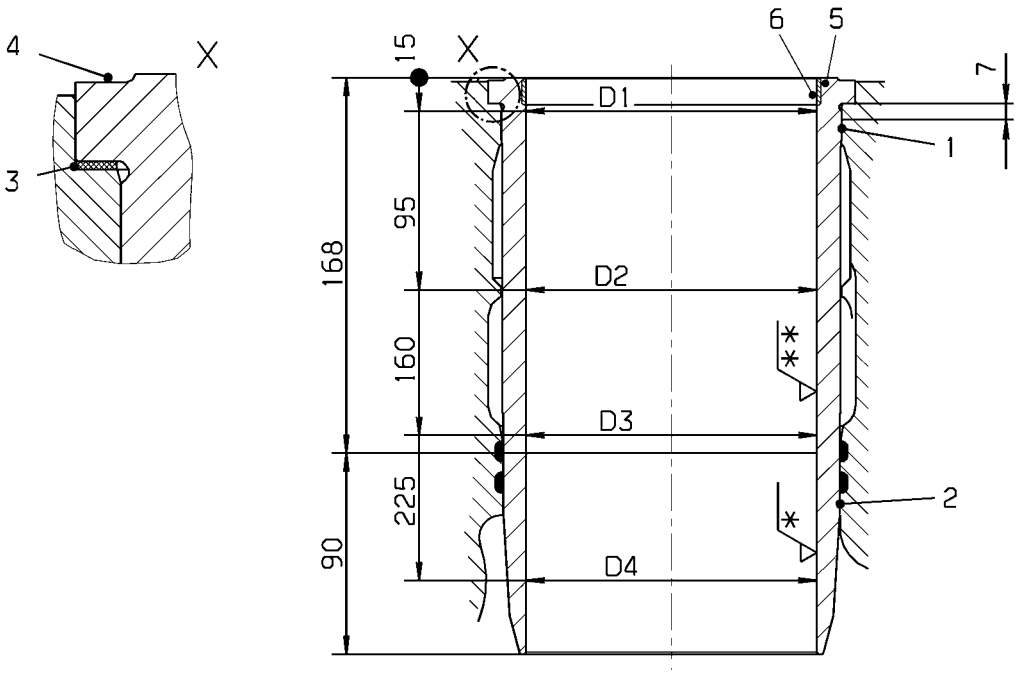
Cylinder Liner with Carbon Scraper Ring



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No.	Designation	Stage	Tol. size	Deviation		Clearance		Interference		Wear limit
			Basic size	lower	upper	min.	max.	min.	max.	
5	Bush bore		134.000 ^{H7}	0	+ 0.040	0.014	0.094			
	Carbon-deposit scraper ring OD		134.000 $_{g7}$	- 0.054	- 0.014					
6	Carbon-deposit scraper ring bore		129.400 ^{H7}	0	+ 0.063					

Note:

Re 1 to 4: For dimensions, see Group 010 Page 1.

Re D 1 to D 4: For dimensions, see Group 010 Page 1.

Re 5 and 6: Carbon-deposit scraper ring and ID checked when fitted.

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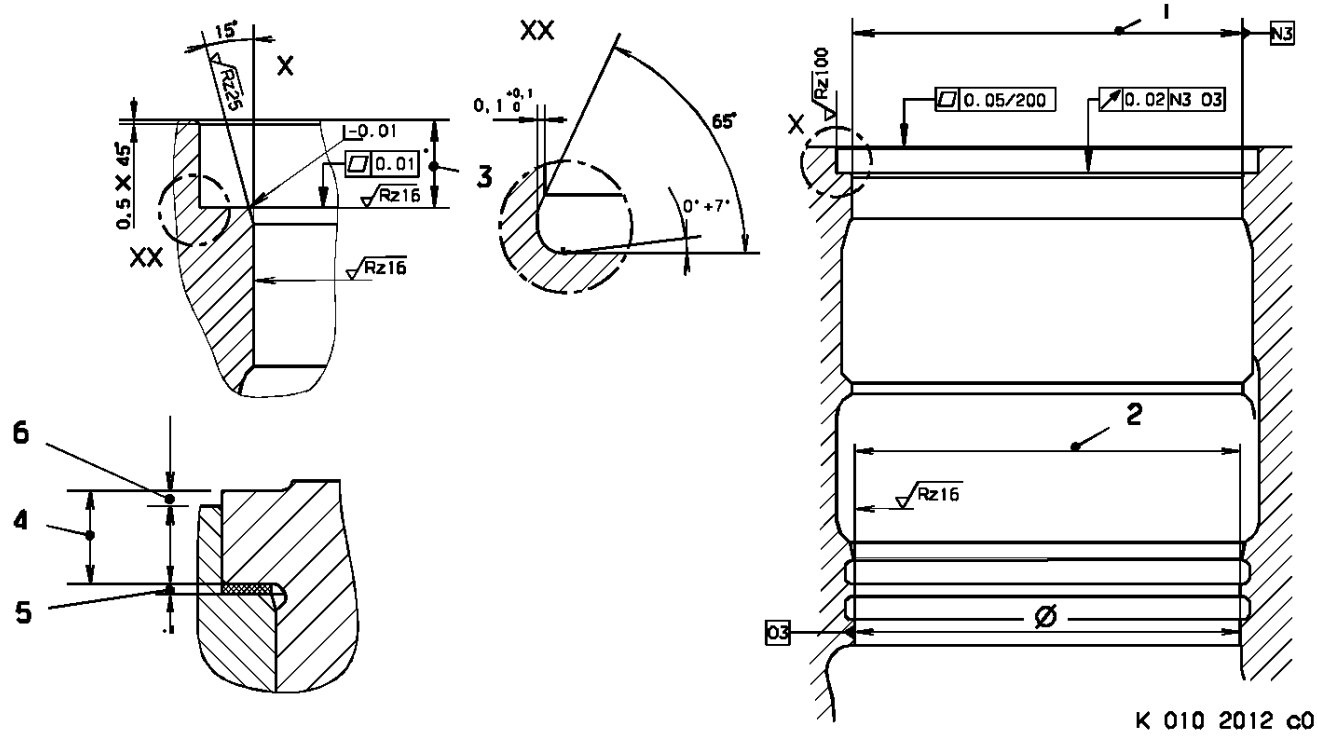
Cylinder Liner, Balcony Seat



No.	Designation	Stage	Tol. size	Deviation		Clearance		Interference		Wear limit
			Basic size	lower	upper	min.	max.	min.	max.	
1	See Page 1, Crankcase bore - upper fit									
2	See Page 1, Crankcase bore - lower fit									
3	Housing	0	9.980	- 0.020	+ 0.020					10.050
	- fit depth	1	10.480							10.550
4	Cylinder liner	0	10.120	- 0.020	0					
	- collar thickness	1	10.620							
5	Sealing ring		0.150	- 0.010	+ 0.010					
6	Cylinder liner projection 0.245 to 0.315									

Note:

Re 6: Cylinder liner projection with pretensioned cylinder liner

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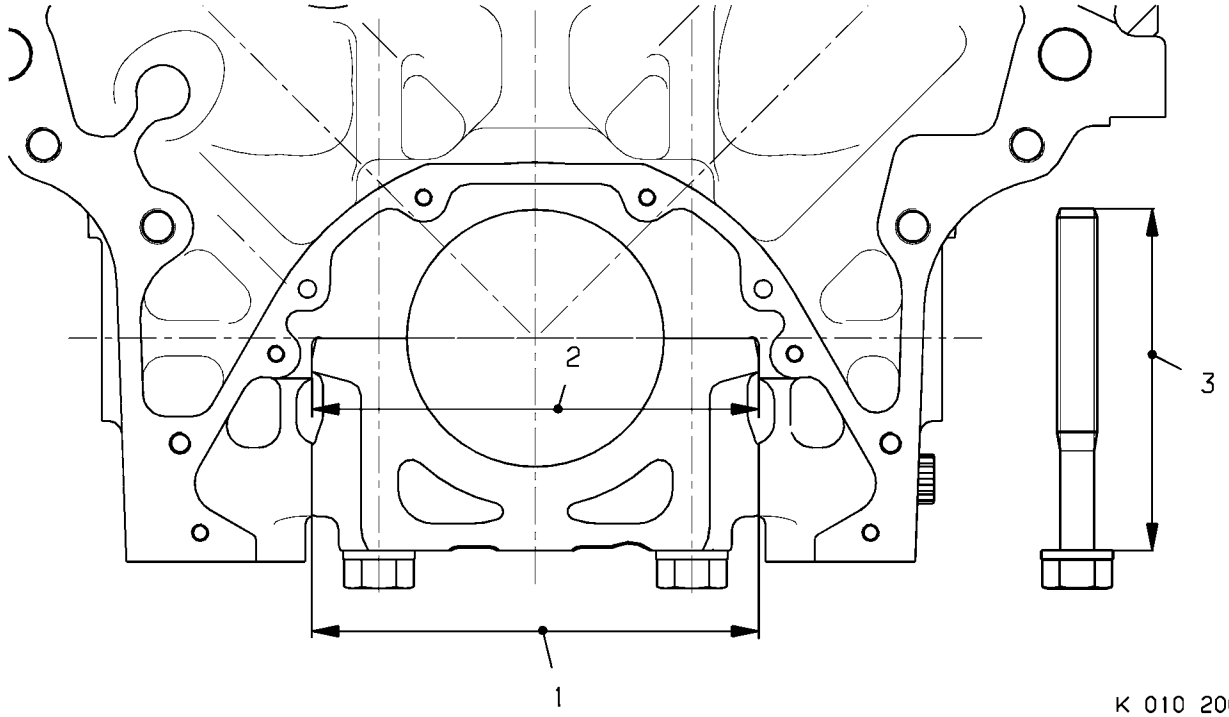
Crankshaft Bearing Cap



K 010 2003 c0

No.	Designation	Stage	Tol. size	Deviation		Clearance		Interference		Wear limit
			Basic size	lower	upper	min.	max.	min.	max.	
1	Bearing cap bed		200.000 ^{E9}	+ 0.100	+ 0.215	0.021	0.165			
	Bearing cap width		200.000 $_{p6}$	+ 0.050	+ 0.079					
2	Bearing cap bed		200.000 ^{H7}	0	+ 0.046			0.004	0.079	
	Bearing cap width		200.000 $_{p6}$	+ 0.050	+ 0.079					
3	Screw length - removed		173.000	- 0.500	0					max. length 176.000

Note:

Re 1: Install bearing cap as specified and tighten screws as per tightening specification.

Re 3: If wear limit has been exceeded: replace screw

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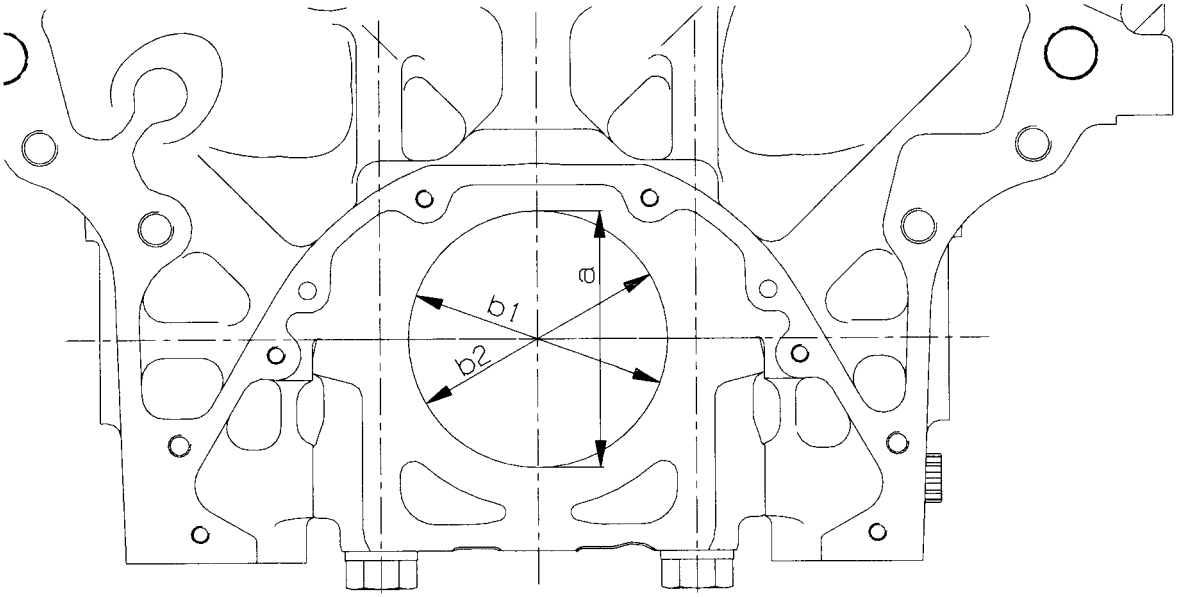
Crankshaft Bearing Bore



K 010 2004 b0

Insert crankshaft bearing cap in crankcase as per installation instructions and tighten screws as per tightening specification.

Measure main bearing bores:

- Determine diameters a, b1 and b2 each in 2 measuring planes and from the results determine the mean values of a, b1 and b2.
- Check roundness of bores:
  Possible deviations from roundness result from the mean values of a, b1 and b2 in accordance with the equation
  0.5 (b1+b2)-a

High out-of-round - a greater than 0.5 (b1+b2) - is not permissible.

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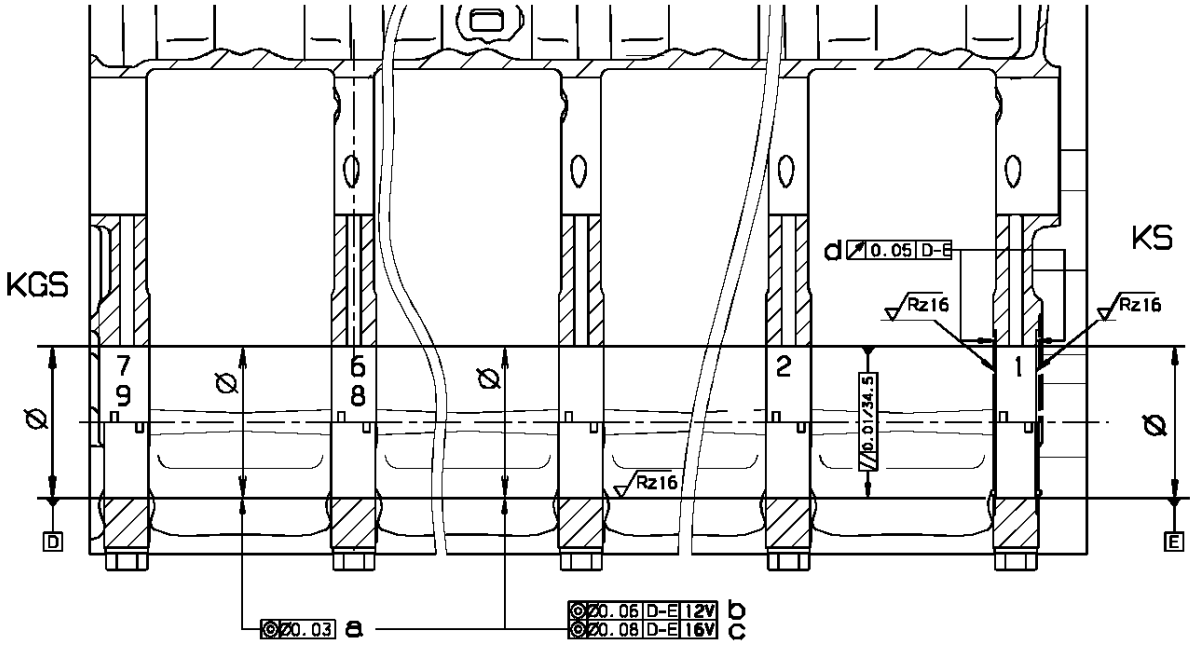
Coaxiality of Crankcase Bores for Crankshaft Bearings



K 010 2005 c0

Max. permissible deviation from coaxiality	New condition	Wear limit
a over three bearings, with adjacent left and right bearings	dia. 0.030	
b 12 V from crankshaft bearing 1 to 7	dia. 0.060	dia. 0.122
c 16 V from crankshaft bearing 1 to 9	dia. 0.080	dia. 0.143
d applicable for all bearings	↗ 0.050	

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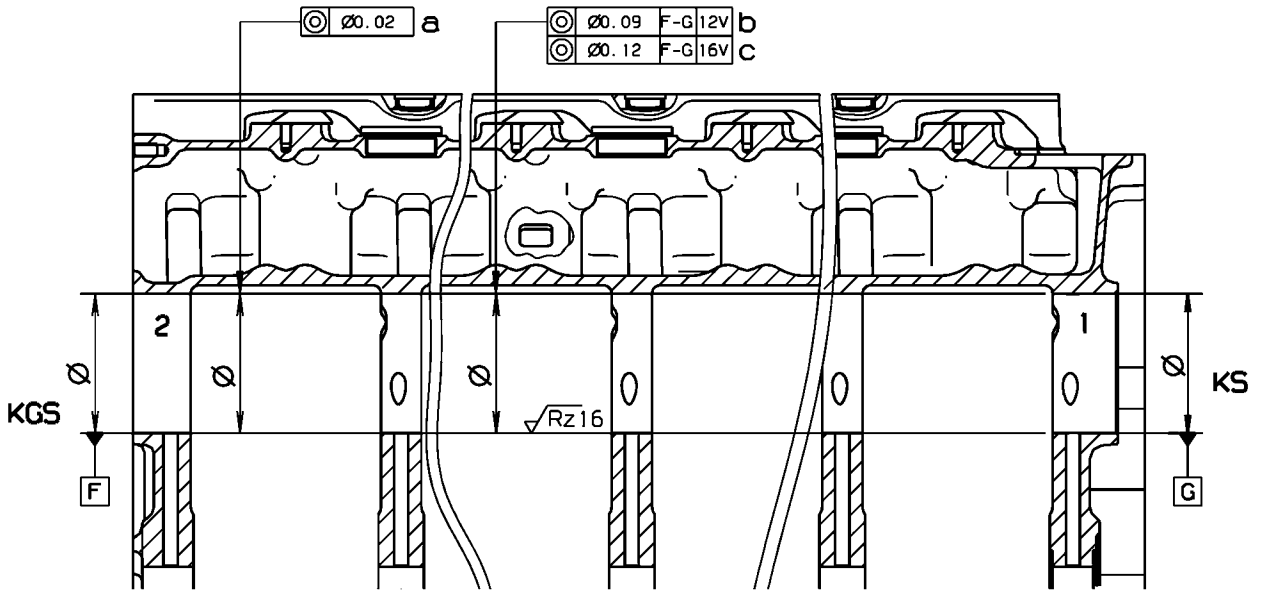
Coaxiality of Crankcase Bores for Camshaft Bearings



K 010 2006 d0

Max. permissible deviation from coaxiality	New condition	Wear limit
a over three bearings, with adjacent left and right bearings	dia. 0.020	dia. 0.051
b 12 V from camshaft bearing 1 to 2	dia. 0.090	dia. 0.104
c 16 V from camshaft bearing 1 to 2	dia. 0.120	

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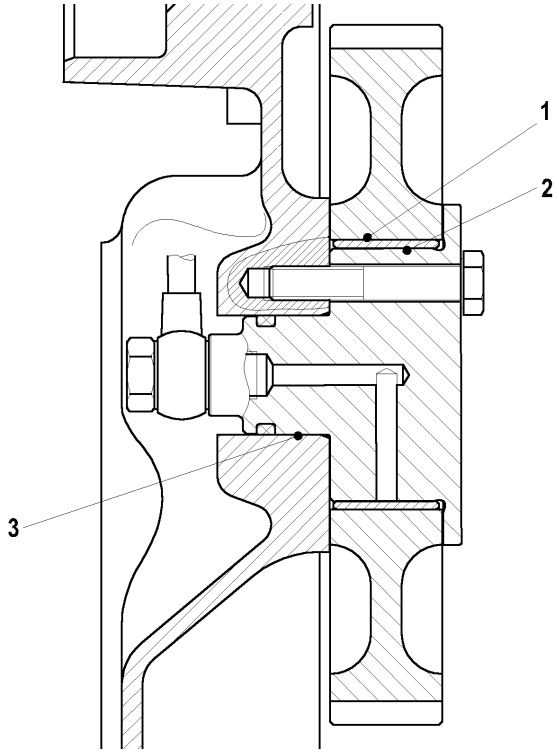
Idler Gear, Free End



No.	Designation	Stage		Deviation		Clearance		Interference		War limit
				lower	upper	min.	max.	min.	max.	
1	Gear bore			79.337	79.373			0.166	0.210	
	Bush OD			79.539	79.547					
2	Bush bore			74.385	74.413	0.075	0.123			
	Hub OD			74.290	74.310					
3	Gearcase bore			35.000	35.025	0.025	0.075			
	Hub OD			34.950	34.975					

Note:
Ref. 1: Compress bush in device with 2300 N and check toleranced size.

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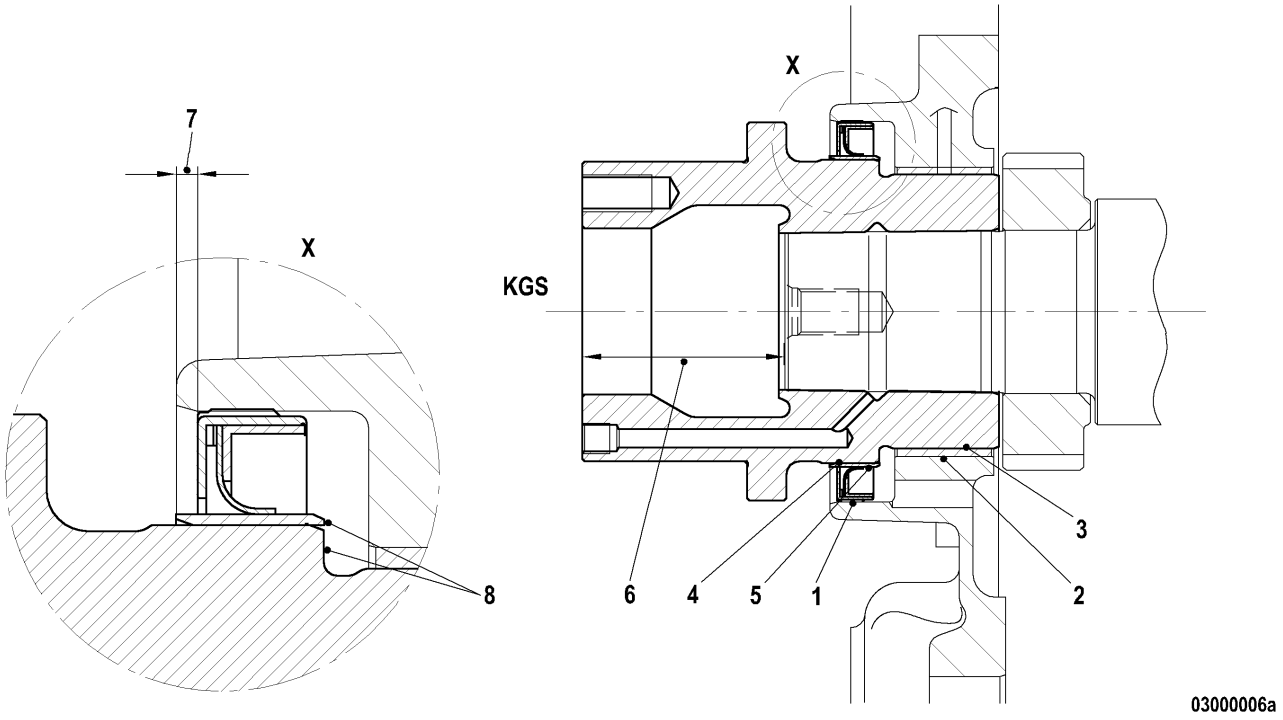
Main Bearing, Free End



No.	Designation	Stage		Deviation		Clearance		Interference		Wear limit
				lower	upper	min.	max.	min.	max.	
1	Gear case cover bore			165.0430	165.1430			0.1870	0.5470	
	Shaft seal OD			165.3300	165.5900					
2	Gear case cover bore			130.0000	130.0250			0.0780	0.1380	
	Bearing OD			130.1030	130.1380					
3	Bearing bore fitted			119.2730	119.3300	0.2210	0.2920			
	Hub OD - Hub not press-fitted			119.0380	119.0520					
4	Track ring			131.4704	131.6228		0.0058		0.2096	
	Hub OD - Hub not press-fitted			131.6170	131.6800					
5	Track ring bore			134.9248	134.9248					
6	Hub - Reference dimension - Hub press-fitted			87.6500	87.7500					
7	Clearance gap - Shaft seal press fitted			3.0000	3.0000					
8	Track ring fitted flush									

Note:

Ref. 5: Track ring worn: Replace track ring

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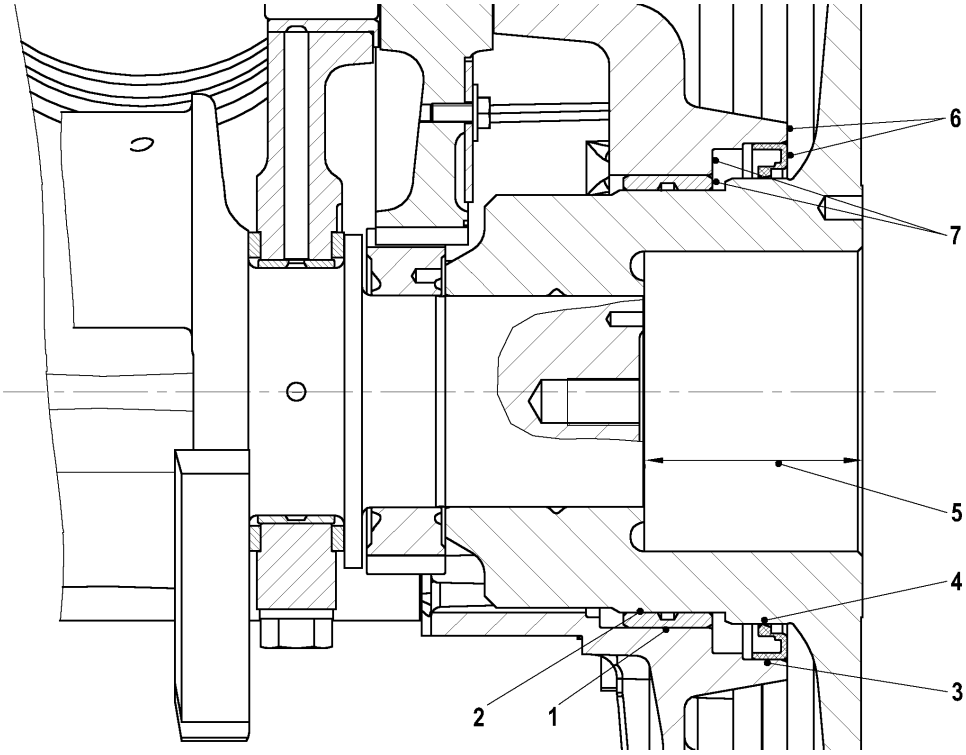
Main Bearing, Driving End



No.	Designation	Stage	Tol. size Basic size	Deviation lower	 upper	Clearance min.	 max.	Interference min.	 max.	Wear limit
1	Flywheel housing bore	0	193.000 ^{H6}	0	+ 0.029			0.183	0.241	
	Bearing OD - removed	0	193.212	0	+ 0.029					
2	Bearing bush bore - Bearing press-fitted	0 - 0 0 - 1 0 - 2 0 - 3	180.142 179.642 179.142 178.642	0	+ 0.079	0.142	0.237			
	Hub OD	0 - 0 0 - 1 0 - 2 0 - 3	180.000 $_{h6}$ 179.500 $_{h6}$ 179.000 $_{h6}$ 178.500 $_{h6}$	- 0.025	0					
3	Running surface OD		190.000 $_{h11}$	- 0.290	0					
4	Radial-lip oil seal press-fitted flush									

Reconditioning instructions:

Ref. 3: Running surface worn: metallize and grind with penetration method

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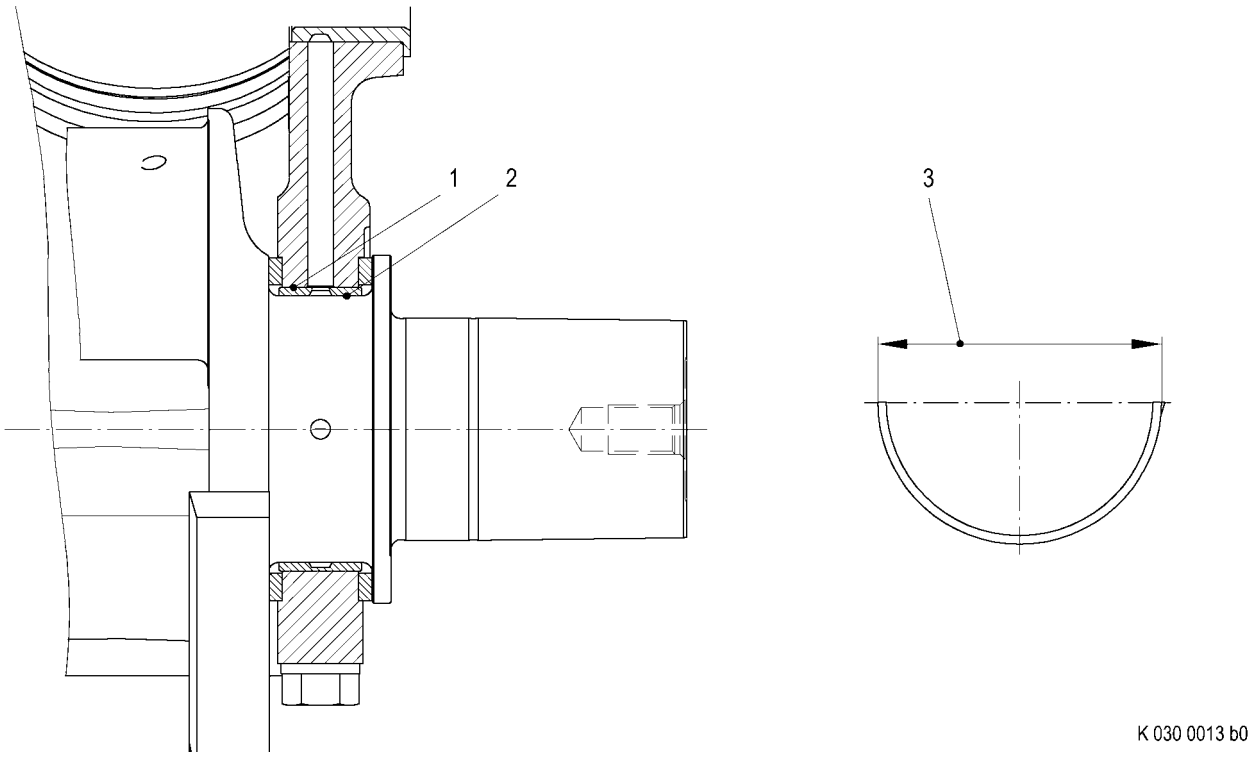
Crankshaft Bearing, Main Bearing



No.	Designation	Stage	Tol. size Basic size	Deviation lower	Deviation upper	Clearance min.	Clearance max.	Interference min.	Interference max.	Wear limit
1	Housing bore		115.000 H6	0	+ 0.022					
2	Main bearing journal dia.	0	108.000	- 0.020	0					
		1	107.900	- 0.020	0					
	Main bearing		Wall thickness							
	- upper half	0	3.460	0	+ 0.012					
	- lower half	1	3.510	0	+ 0.012					
3	Spreading dimension, bearing shell - upper and lower halves removed		115.000	0	+ 0.100					

Note:

Ref. 2: Clearance: Theoretical dimension 0.066 - 0.132

Wall thickness difference per bearing shell 0.006

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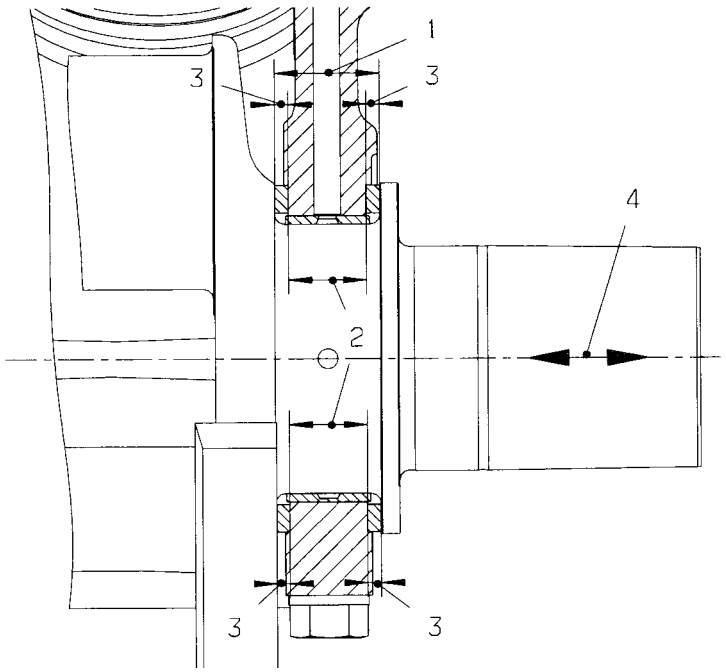
Axial Clearance - Crankshaft



K 030 2003 b0

No.	Designation	Stage	Tol. size Basic size	Deviation lower	Deviation upper	Clearance min.	Clearance max.	Interference min.	Interference max.	Wear limit
1	Main bearing journal width	0	42.000 ^{H9}	0	+ 0.062					
		1	42.000 ^{H9}							
		2	42.500 ^{H9}	0	+ 0.062					
		3	42.500 ^{H9}							
		4	43.000 ^{H9}	0	+ 0.062					
		5	43.000 ^{H9}							
2	Crankcase, bearing cap - width		31.000 $_{h8}$	- 0.039	0					
3	Friction washer	01	5.375	0	+ 0.050					
	- upper half	02	5.625	0	+ 0.050					
	- lower half	03	5.875	0	+ 0.050					
	- thickness									
4	Axial clearance - crankshaft					0.150	0.350			

Note:

Re 4: Axial clearance, crankshaft: adjusted with friction washers No. 3.
Friction washers of equal thickness must be fitted on both crankshaft alignment bearing ends.

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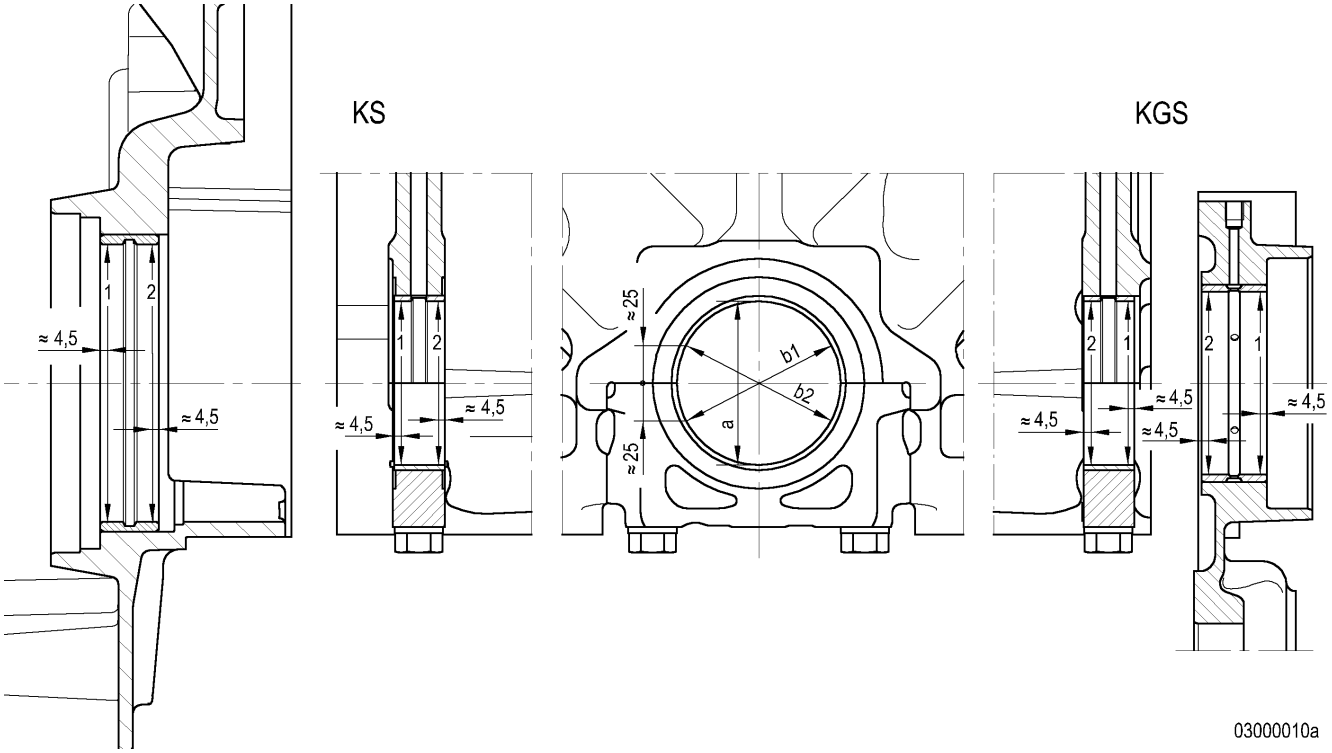
Crankshaft Bearing Shells



Install bearing shells and tighten bearing cap according to tightening specifications.

Measure crankshaft bearing bores:

- Determine diameters, a, b1 and b2 in measuring planes 1 and 2 and in each case calculate mean values of a, b1 and b2.
- Check roundness of bores:

  Possible deviations from roundness result from the mean values of a, b1 and b2 in accordance with the equation 0.5 (b1+b2) -a

Replace bearing shells:

- If deviation from roundness > 0.040
- If b1 to b2 greater than / less than 0.040
- With vertical ovality - a > 0.5 (b1+b2) - is not permissible.

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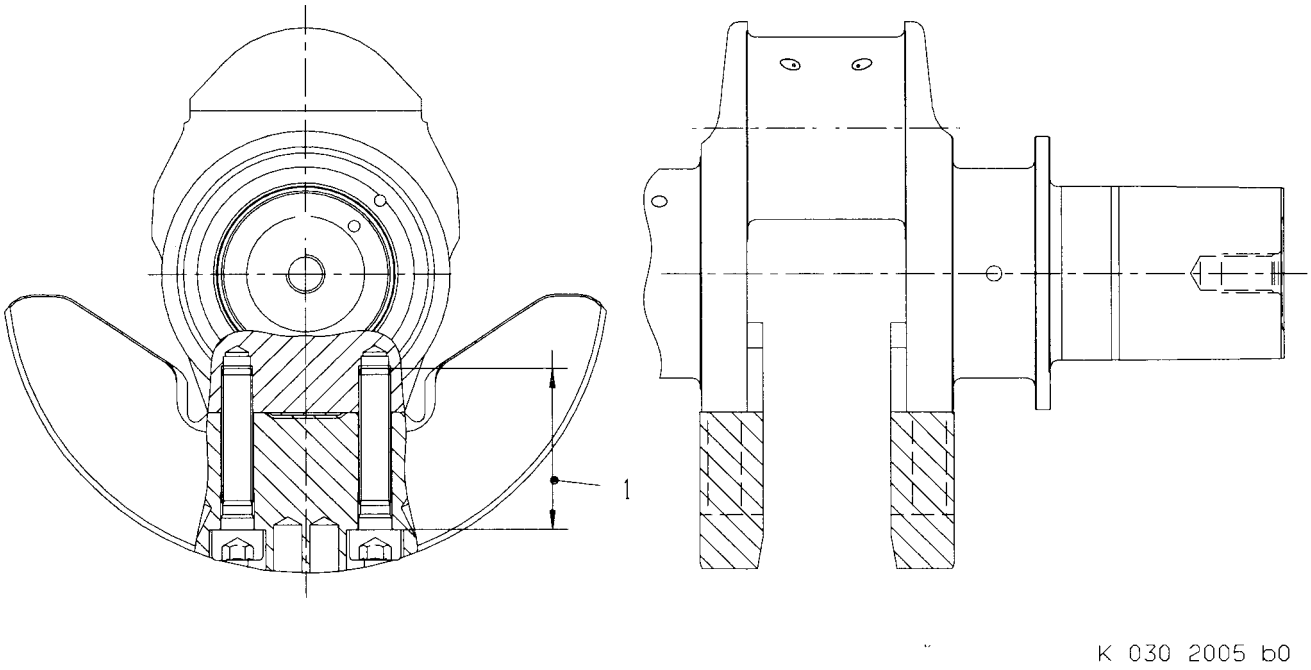
Counterweight Fixture



No.	Designation	Stage	Tol. size	Deviation		Clearance		Interference		Wear limit
			Basic size	lower	upper	min.	max.	min.	max.	
1	Screw length - removed		83.000	- 0.500	0					max. length 84.000

Reconditioning instructions:

Ref. 1: If wear limit has been exceeded: replace screw

Note:

12V crankshaft has no counterweights.

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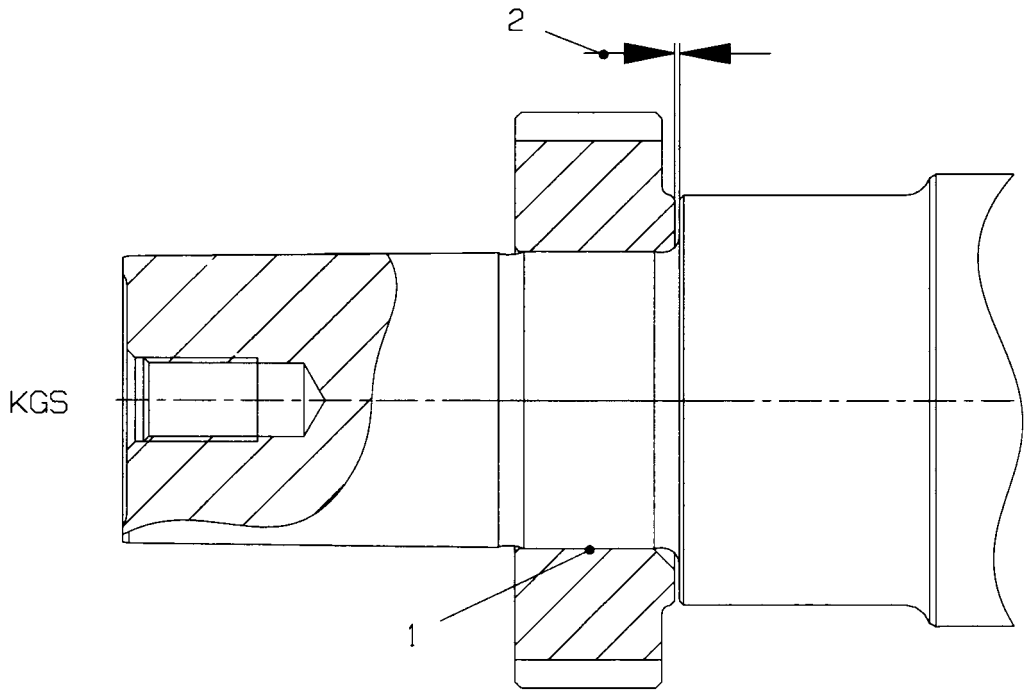
Crankshaft Gear, Free End



K 030 2007 b0

No.	Designation	Stage	Tol. size	Deviation		Clearance		Interference		Wear limit
			Basic size	lower	upper	min.	max.	min.	max.	
1	Gear bore		71.000 ^{S7}	- 0.078	- 0.048			0.080	0.140	
	Shaft OD		71.000 $_{p7}$	+ 0.032	+ 0.062					
2	Clearance gap - gear press-fitted		2.000	- 0.200	+ 0.200					

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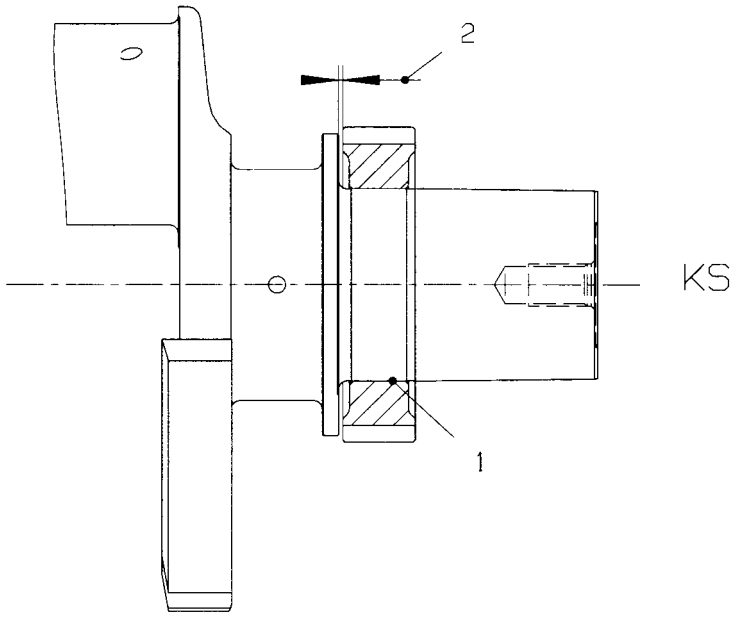
Crankshaft Gear, Driving End



K 030 2006 b0

No.	Designation	Stage	Tol. size	Deviation		Clearance		Interference		Wear limit
			Basic size	lower	upper	min.	max.	min.	max.	
1	Gear bore		90.300 ^{M7}	- 0.035	0			0.091	0.148	
	Shaft OD		90.300 $_{t6}$	+ 0.091	+ 0.113					
2	Clearance gap gear press-fitted		2.000	- 0.200	+ 0.200					

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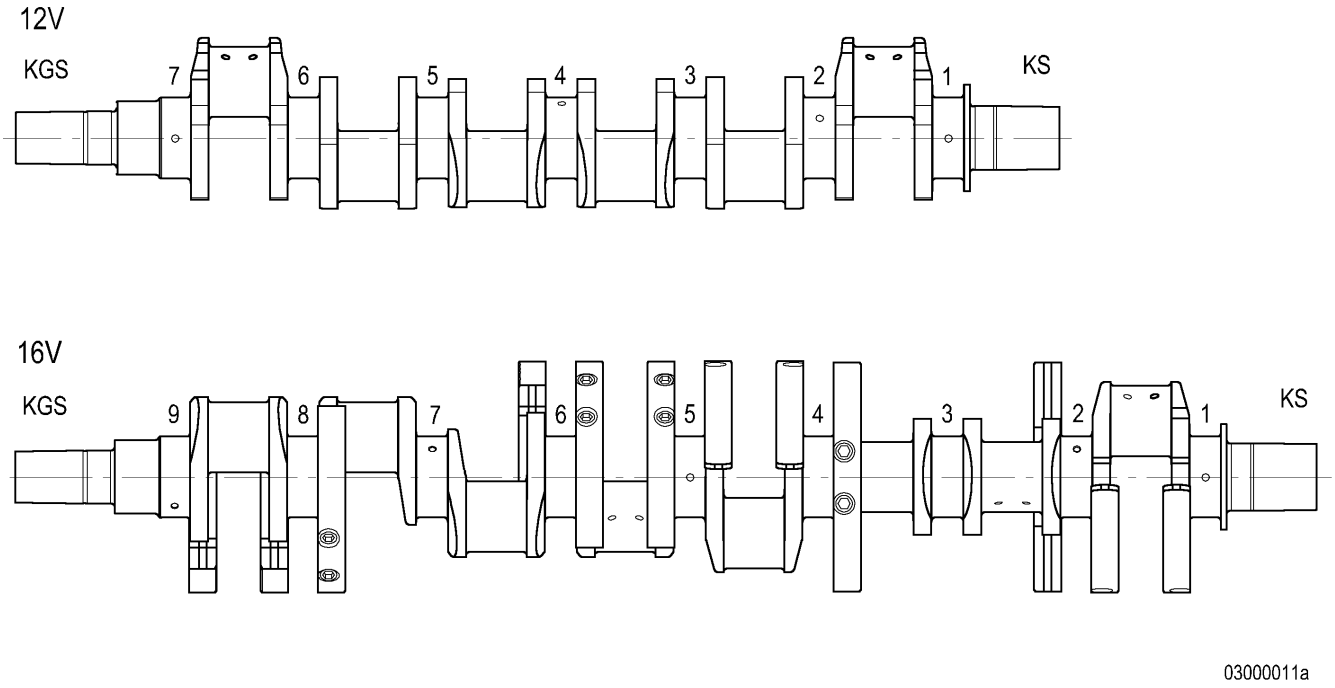
Crankshaft, Coaxiality of the Main Bearing Journals



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Max. permissible deviation from coaxiality		New condition	Wear limit
12 V	From main bearing journal 1 to main bearing journal 7	↗ 0.080	
	From main bearing journal to main bearing journal Fixed bearing under main bearing journals 1 and 7 and support bearing floating, main bearing journal 4	↗ 0.020	
16 V	From main bearing journal 1 to main bearing journal 9	↗ 0.080	
	From main bearing journal to main bearing journal Fixed bearing under main bearing journals 1 and 9 and support bearing floating, main bearing journal 5	↗ 0.020	

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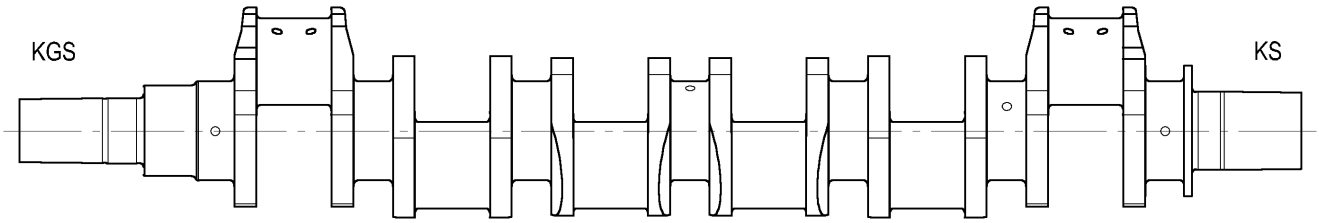
Crankshaft,12V:Dynamic balancing



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Note:

Balancing of 12V-crankshaft not necessary as there are no counterweights.

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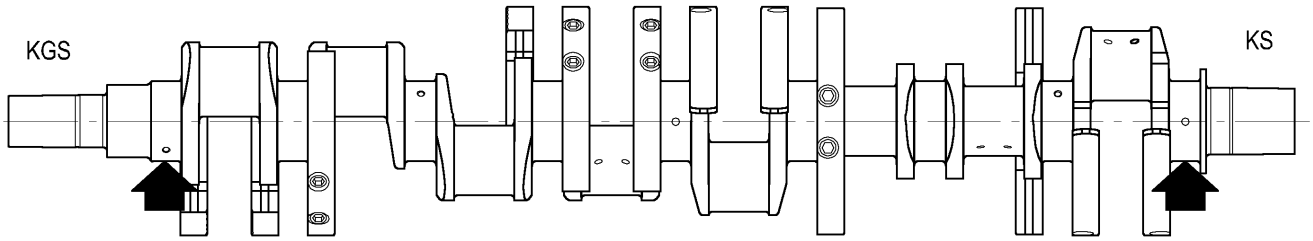
Crankshaft, 16V:Dynamic balancing



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Balancing specification			New condition	Wear limit
16 V	Max. operating speed:	2300 rpm		
	Mass of balancing group:	303 kg		
	The crankshaft must be supported at main bearings 1 and 9.			
	Balancing speed:	150 rpm		
	Permissible residual imbalance for each balancing plane during initial balancing::		80 gcm	
	Permissible residual imbalance for each balancing plane for comparable balancing in other clamping or balancing machinery		240 gcm	

Reconditioning instructions:

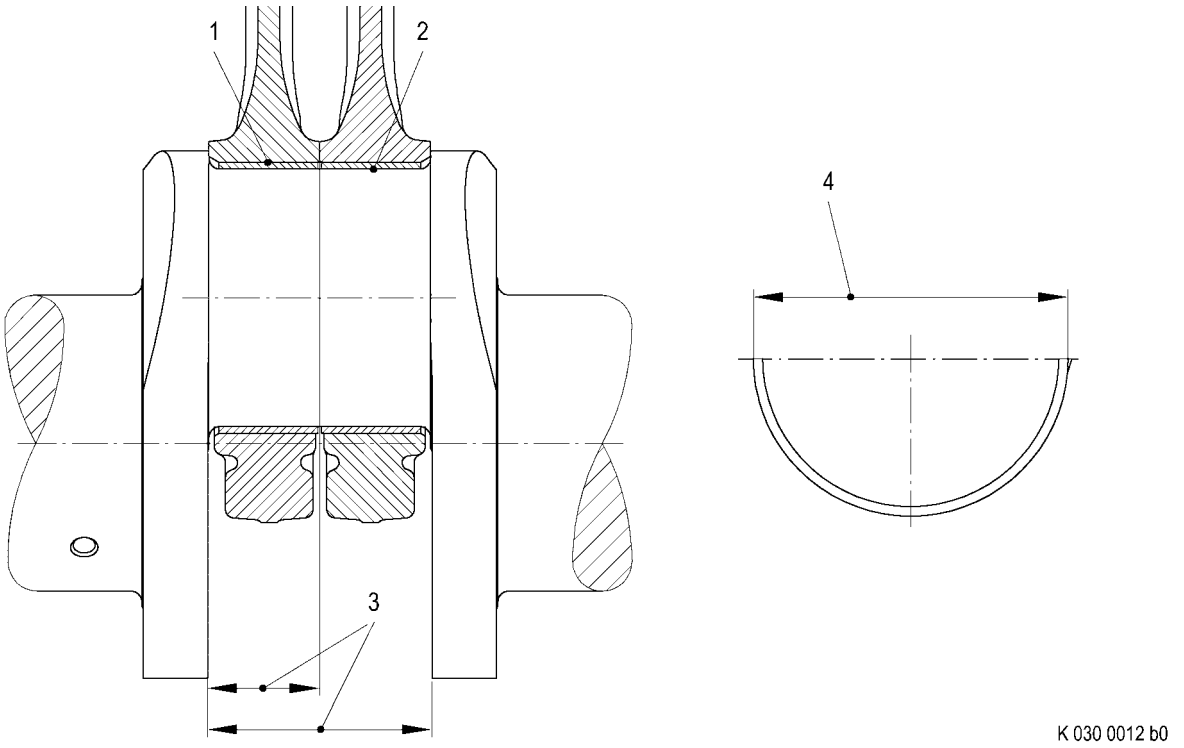
It will only be necessary to rebalance the crankshaft if the counterweights have been replaced.

If a crankshaft has been reworked to the next repair stage, rebalancing will not be necessary provided that the counterweights have not been replaced or exchanged among one another.

Mark the counterweights and reassemble them according to marking.

© MTU

Conrod Bearing



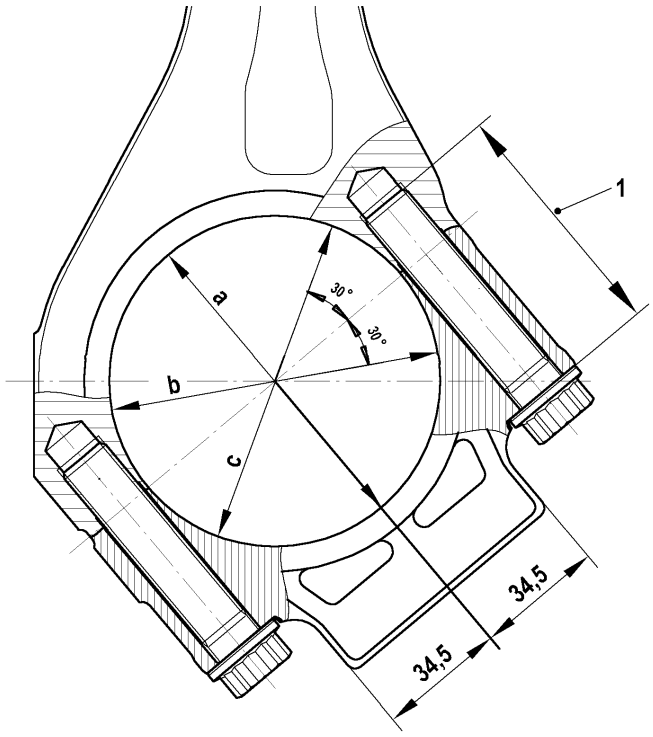
No.	Designation	Stage	Tol. size	Deviation		Clearance		Interference		Wear limit
			Basic size	lower	upper	min.	max.	min.	max.	
1	Conrod bore		99.000 H6	0	+ 0.022					
2	Crankpin journal	0	94.000	- 0.020	0					
	dia.	1	93.900	- 0.020	0					
	Conrod bearing		Wall thickness							
	- upper half	0	2.473	0	- 0.010					
		1	2.523	0	- 0.010					
	- lower half	0	2.463	0	+ 0.010					
		1	2.513	0	+ 0.010					
3	Crankpin length		81.000 H10	0	+ 0.140	0.500	0.760			
	Conrod width		40.500	- 0.190	- 0.120					
4	Spreading dim. bearing shells									
	- upper half		99.600	0	+ 0.100					
	- lower half		99.600	0	+ 0.100					
	- removed									

Note:

Ref. 2: Clearance: Theoretical dimension: 0.064 - 0.126
Wall thickness difference per bearing shell: 0.006

© MTU

Conrod Bearing Bore



03000007a

No.	Designation	Stage	Tol. size	Deviation		Clearance		Interference		Wear limit
			Basic size	lower	upper	min.	max.	min.	max.	
1	Screw length - removed		67.500	- 0.300	0					68.500

Note:

Tighten conrod - conrod cap as per tightening specifications.

Conrod bearing - measure bearing bore in a, b and c. Min. dimension must be in direction a.

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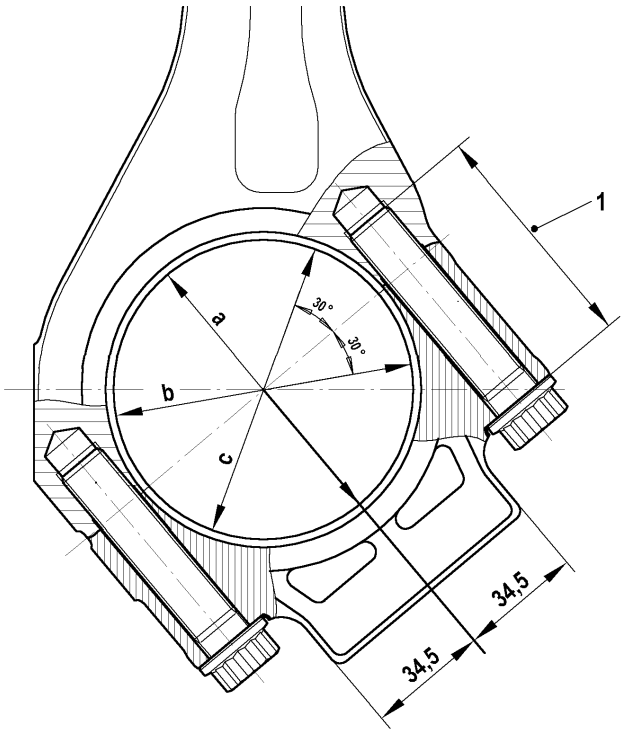
Conrod Bearing Shells



03000008a

No.	Designation	Stage	Tol. size	Deviation		Clearance		Interference		Wear limit
			Basic size	lower	upper	min.	max.	min.	max.	
1	Screw length - removed		67.500	- 0.300	0					68.500

Note:

Tighten conrod bearing - conrod - conrod cap as per tightening specifications.

Conrod bearing - measure bearing bore in a, b and c. Min. dimension must be in direction a.

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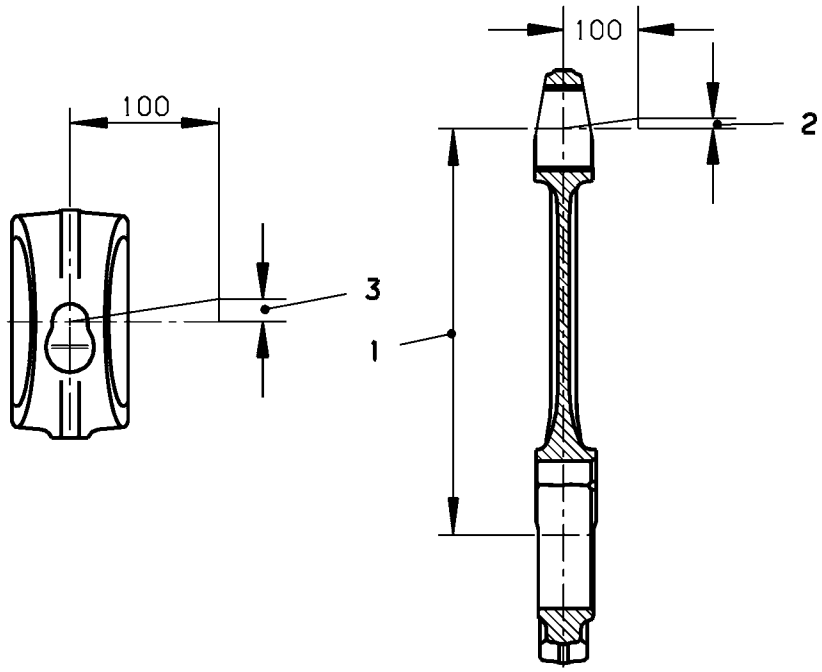
Parallellity of Conrod Bores



K 030 2013 c0

No.	Designation	Stage	Tol. size	Deviation		Clearance		Interference		Wear limit
			Basic size	lower	upper	min.	max.	min.	max.	
1	Conrod length - with bush and without bearing shells		273.000	- 0.020	0.020					
	Conrod length - without bush and without bearing shells		273.000	- 0.050	+ 0.050					
2	Parallellity of axles - Inclination	0.050 measured at 100 mm distance								
3	Parallellity of axles - twist	0.100 measured at 100 mm distance								
	Conrod weight		3930 g	- 30 g	+ 30 g					

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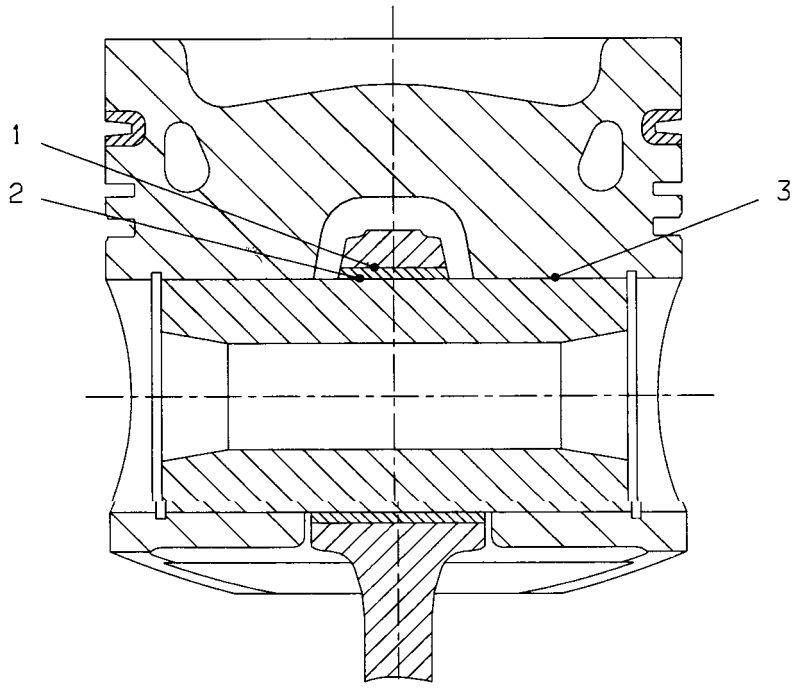
Piston Bearing



K 030 2017 b0

No.	Designation	Stage	Tol. size	Deviation		Clearance		Interference		Wear limit
			Basic size	lower	upper	min.	max.	min.	max.	
1	Conrod bore		57.000 ^{H6}	0	+ 0.019			0.061	0.100	Press-in force
	Bush OD		57.080	0	+ 0.020					min. 10000 N max. 30000 N
2	Bush ID - finished-machined		52.060	- 0.005	+ 0.005	0.067	0.073			
	Piston pin OD		52.000	- 0.008	- 0.002					
3	Piston bore		52.000	+ 0.010	+ 0.016	0.012	0.024			
	Piston pin OD		52.000	- 0.008	- 0.002					

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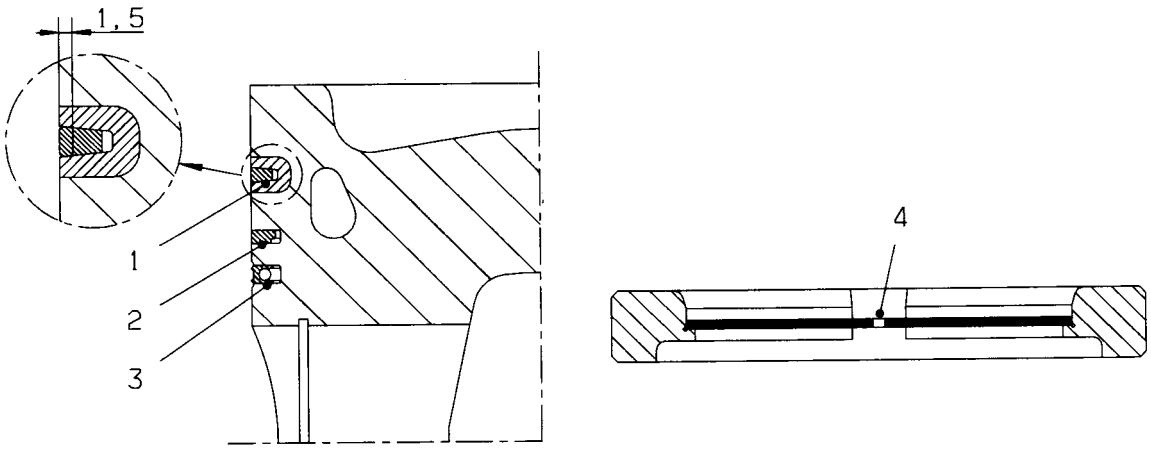
Piston Rings



K 030 2015 b0

No.	Designation	Stage	Tol. size	Deviation		Clearance		Interference		Wear limit
			Basic size	lower	upper	min.	max.	min.	max.	
1	Groove width		2.963	- 0.015	+ 0.015	0.124	0.178			
	Keystone-type compression ring		2.834	- 0.035	- 0.010					
2	Groove width		3.000	+ 0.060	+ 0.080	0.060	0.110			
	Taper face compression ring		3.000	- 0.030	0					
3	Groove width		4.000	+ 0.030	+ 0.050	0.030	0.080			
	Oil control ring		4.000	- 0.030	0					
4	Ring end clearance									
	Keystone-type compression ring					0.350	0.600			
	Taper face compression ring					0.800	1.050			
	Oil control ring					0.300	0.450			

Note:

Re 4: Measure ring end clearance in ring gauge 130.000 ^{H6}

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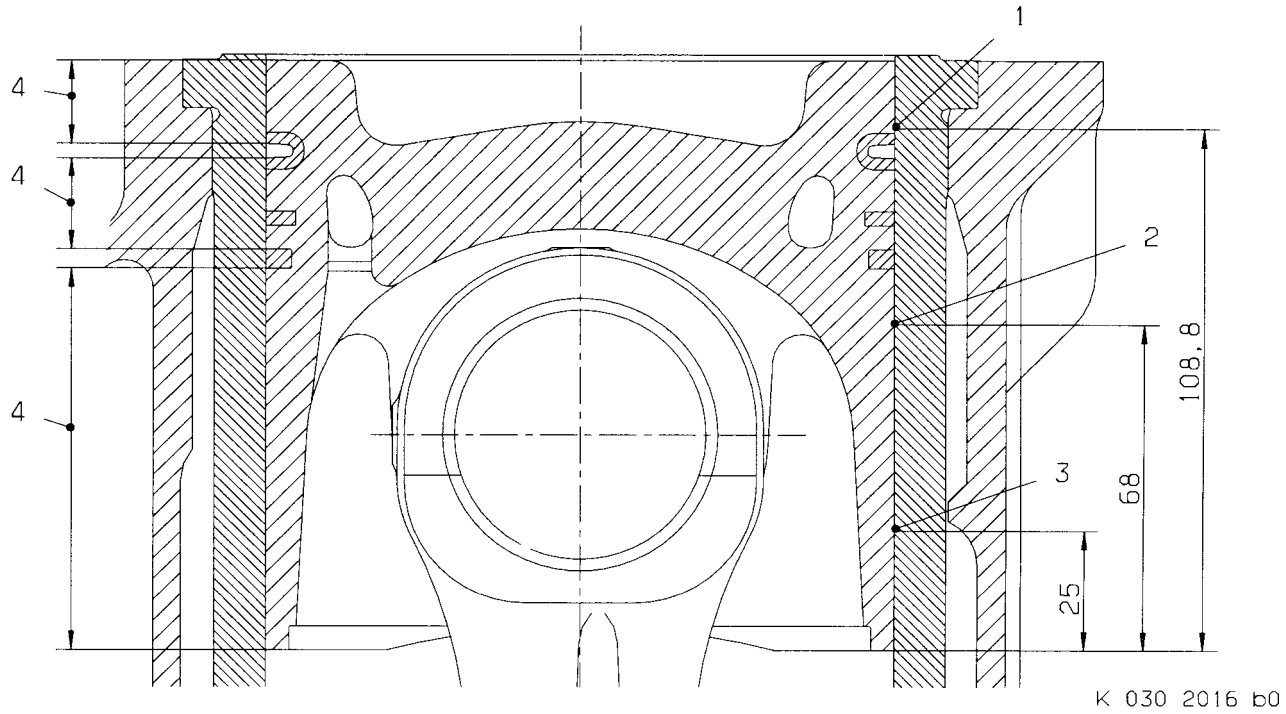
Piston Clearance in Cylinder Liner



No.	Designation	Stage	Tol. size	Deviation		Clearance		Interference		Wear limit
			Basic size	lower	upper	min.	max.	min.	max.	
1	Cylinder liner bore		130.000	- 0.010	+ 0.010	0.628	0.772			
	Piston dia.		129.350	- 0.012	+ 0.012					
2	Cylinder liner bore		130.000	- 0.010	+ 0.010	0.206	0.240			
	Piston dia.		129.777	- 0.007	+ 0.007					
3	Cylinder liner bore		130.000	- 0.010	+ 0.010	0.133	0.167			
	Piston dia.		129.850	- 0.007	+ 0.007					

Note:

Re 1 to 3: Measure piston dia. transverse to piston pin axle

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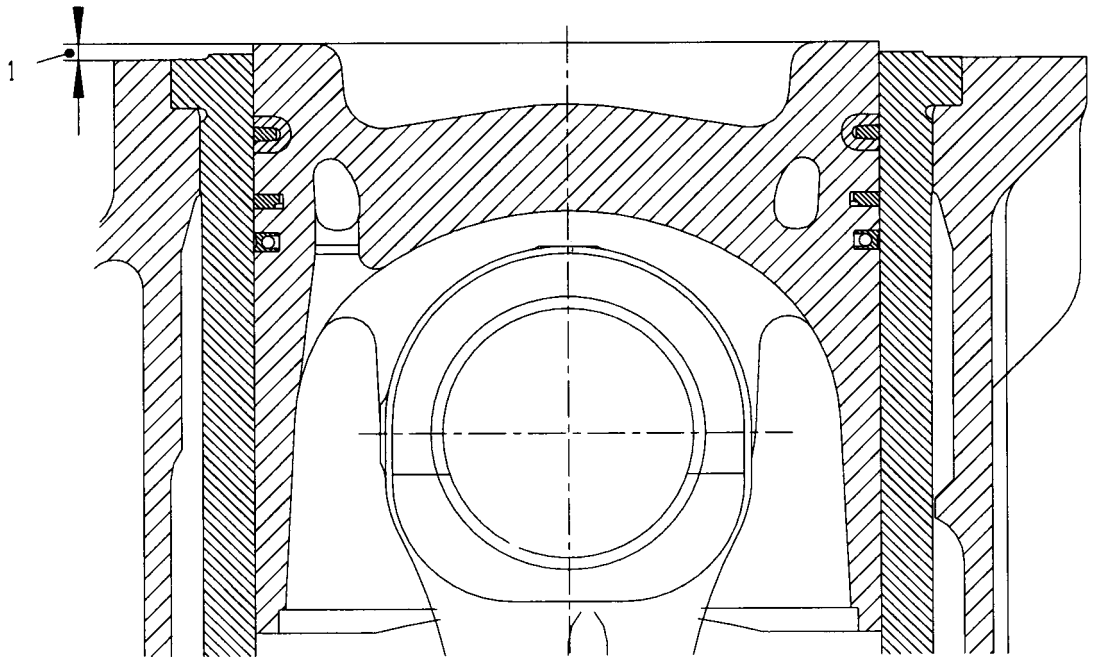
Piston Projection without carbon-scraper ring



No.	Designation	Stage	Tol. size	Deviation		Clearance		Interference		Wear limit
			Basic size	lower	upper	min.	max.	min.	max.	
1	Projection with piston in TDC		0.290 to 0.770							

Note:

Re 1: Measure projection between piston crown and engine block partition without cylinder head gasket fitted.

Measuring must be carried out in direction of piston pin to rule out piston tilt play.

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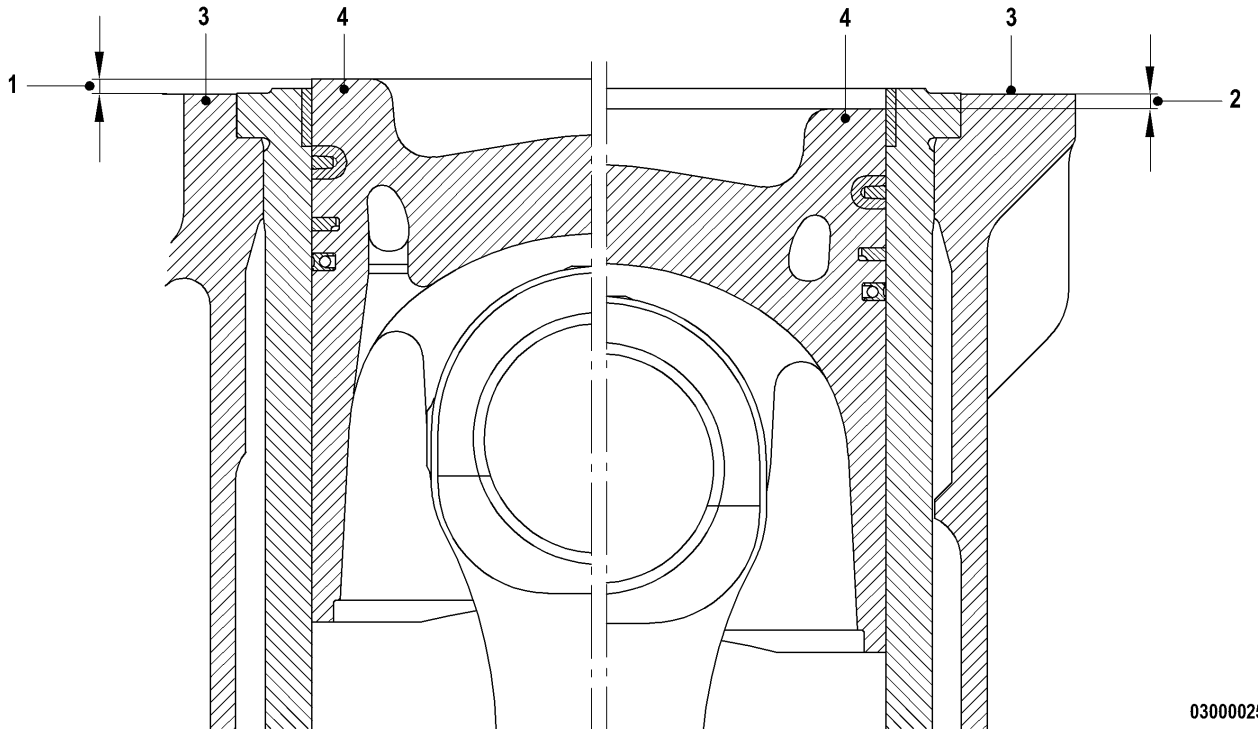
Piston clearance with carbon-scraper ring



No.	Designation	Stage	Tol. size	Deviation		Clearance		Interference		Wear limit
			Basic size	lower	upper	min.	max.	min.	max.	
1	Piston projection		0	0	+ 0.220					
2	Piston clearance		0	- 0.260	0					
3	Crankcase									
4	Piston									

Note:

Re 1: Measure projection between crankcase top (3) and piston crown (4).
Measuring must be carried out in parallel with piston pin to preclude piston slap.

Re 2: Measure projection between crankcase top (3) and piston crown (4).
Measuring must be carried out in parallel with piston pin to preclude piston slap.

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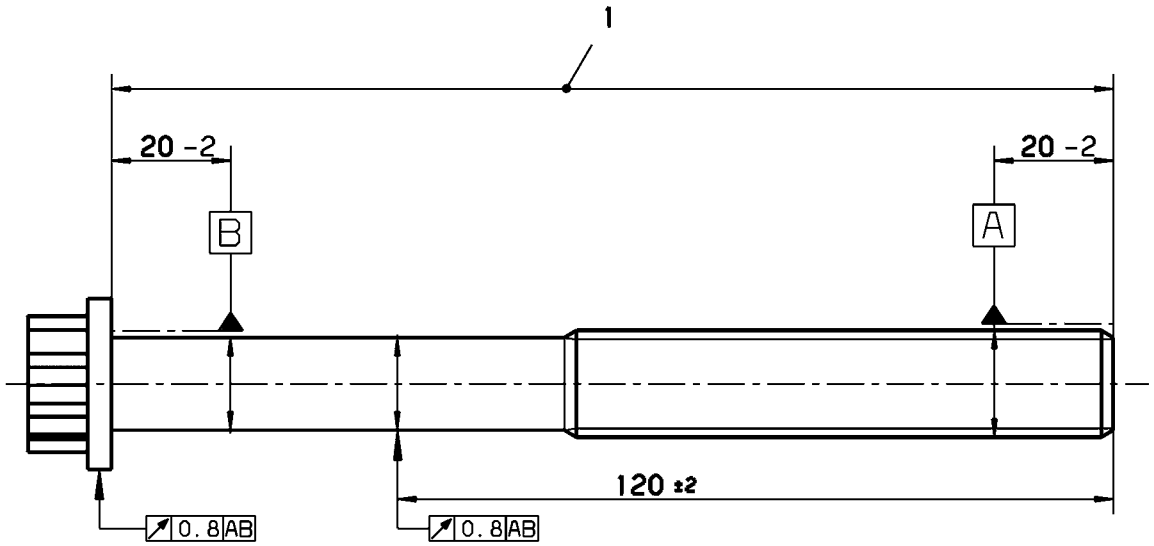
Cylinder Head Screw Fixture



K 040 2008 b0

No.	Designation	Stage	Tol. size	Deviation		Clearance		Interference		Wear limit
			Basic size	lower	upper	min.	max.	min.	max.	
1	Screw - removed		210.000	- 0.500	0					max. length 212.000

Note:
Ref. 1: If wear limit has been exceeded: replace screw

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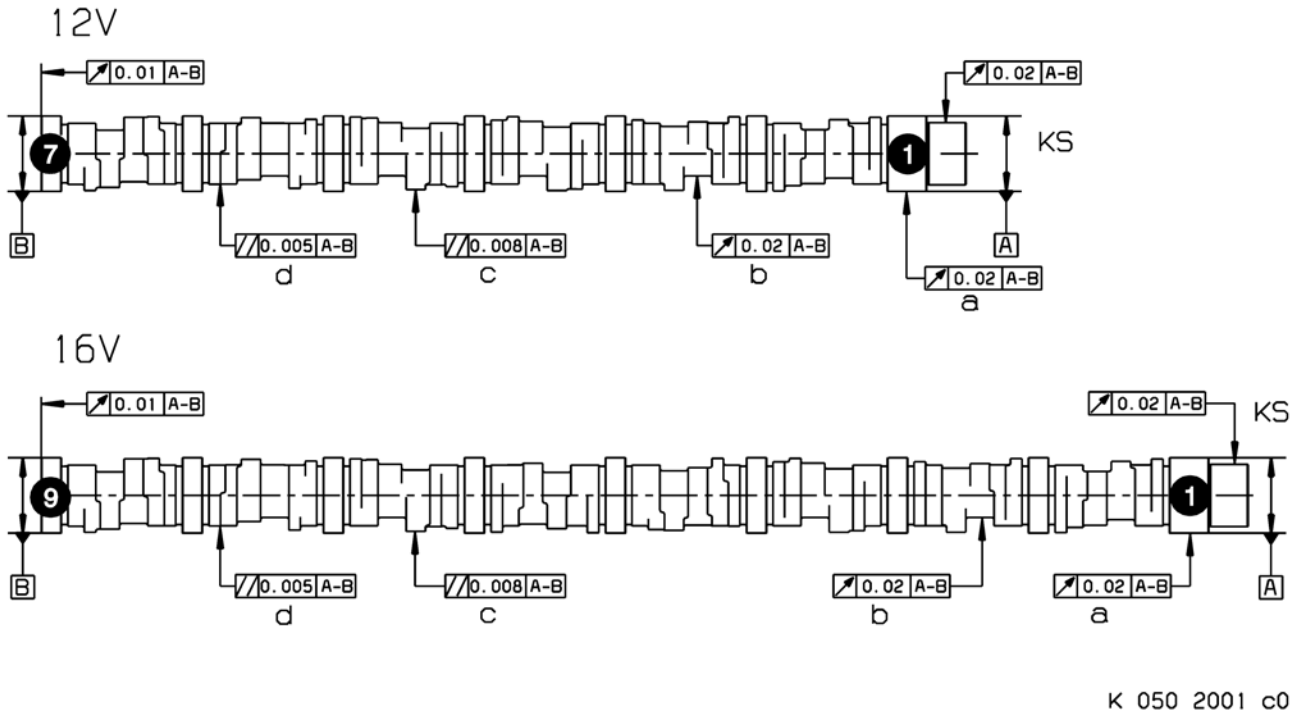
Camshaft, Coaxiality of Bearings



K 050 2001 c0

Max. permissible deviation from coaxiality	New condition	Wear limit
12 V		
From bearing 1 to bearing 7	↗ 0.050	
a From bearing to bearing	↗ 0.020	
b All cams on base circle	↗ 0.050	
c All pump cams	// 0.008	
d All conrol cams	// 0.005	
16 V		
from bearing 1 to bearing 9	↗ 0.050	
a From bearing to bearing	↗ 0.020	
b All cams on base circle	↗ 0.050	
c All pump cams	// 0.008	
d All conrol cams	// 0.005	

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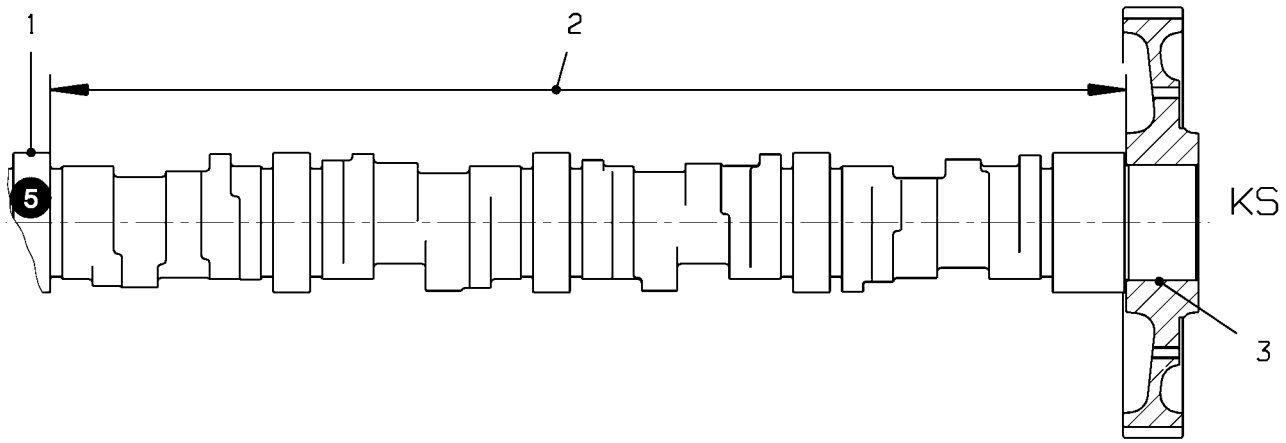
Camshaft Gear, Driving End



K 050 2002 c0

No.	Designation	Stage	Tol. size Basic size	Deviation lower	 upper	Clearance min.	 max.	Interference min.	 max.	Wear limit
1	Bearing 5									
2	Distance: - gear press-fitted		711.700	- 0.100	+ 0.100					
3	Gear bore		76.000 ^{J7}	- 0.012	+ 0.018			0.057	0.106	
	Shaft OD		76.000 $_{t6}$	+ 0.075	+ 0.094					

Note:
Ref. 2: Distance between gear hub and bearing 5

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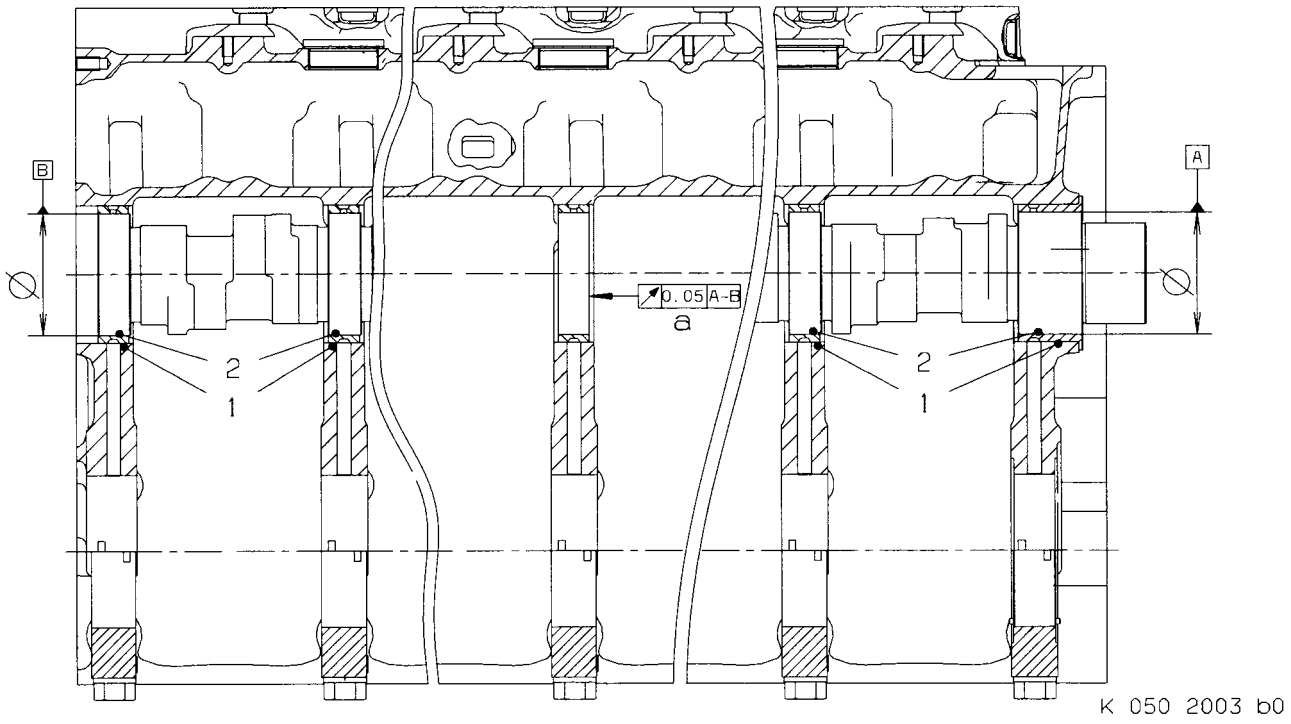
Camshaft Bearings



No.	Designation	Stage	Tol. size Basic size	Deviation lower	 upper	Clearance min.	 max.	Interference min.	 max.	Wear limit
1	Housing bore	0 - 0 0 - 1	104.000 H6 104.500 H6	0	+ 0.022			0.043	0.084	
	Busg OD - not installed	0 - 0 0 - 1	104.065 104.565	0	+ 0.019					
2	Bush bore - installed		92.020	0	+ 0.045	0.092	0.172			
	Camshaft OD		92.000 e7	- 0.107	- 0.072					
a	All bearings		↗ 0.050							

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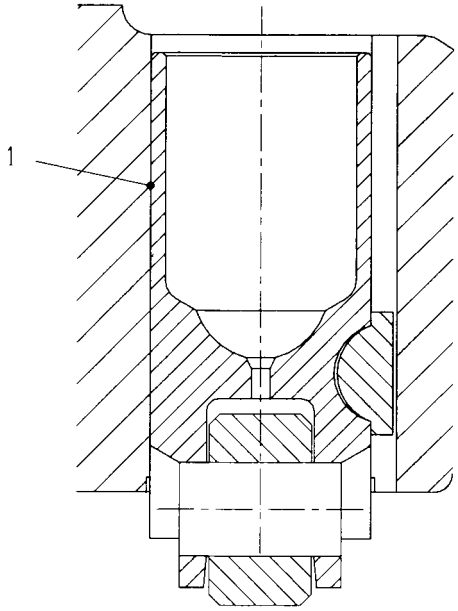
Valve Roller Tappets



K 050 2004 b0

No.	Designation	Stage		Deviation		Clearance		Interference		Wear limit
				lower	upper	min.	max.	min.	max.	
1	Housing bore	0		30.000	30.021	0.035	0.077			
		1		30.500	30.525	0.035	0.081			
	Tappet OD	0		29.944	29.965					
		1		30.444	30.465					

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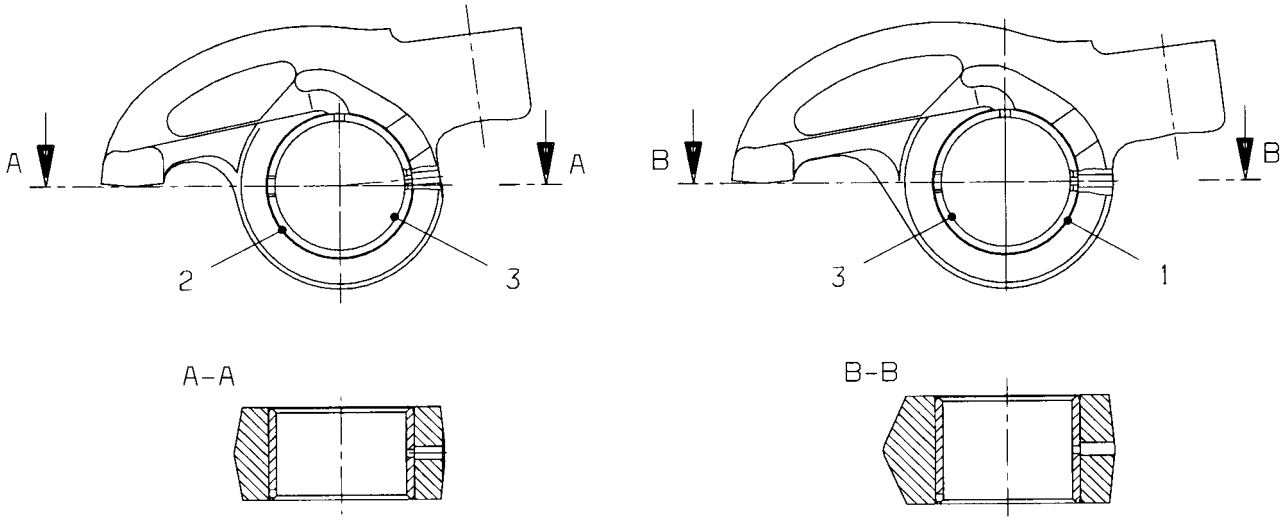
Rocker Arm Bearing Arrangement



K 050 2005 b0

No.	Designation	Stage	Tol. size	Deviation		Clearance		Interference		Wear limit
			Basic size	lower	upper	min.	max.	min.	max.	
1	Rocker arm bore - exhaust		28.000 ^{H9}	0	+ 0.052			0.348	0.600	
	Rocker arm bush OD		28.400	0	+ 0.020					
2	Rocker arm bore - inlet		28.000 ^{H9}	0	+ 0.052			0.348	0.600	
	Rocker arm bush OD		28.400	0	+ 0.020					
3	Rocker arm bush bore		25.000	- 0.005	+ 0.021	0.015	0.054			
	Rocker shaft support OD		25.000 $_{f6}$	- 0.033	- 0.020					

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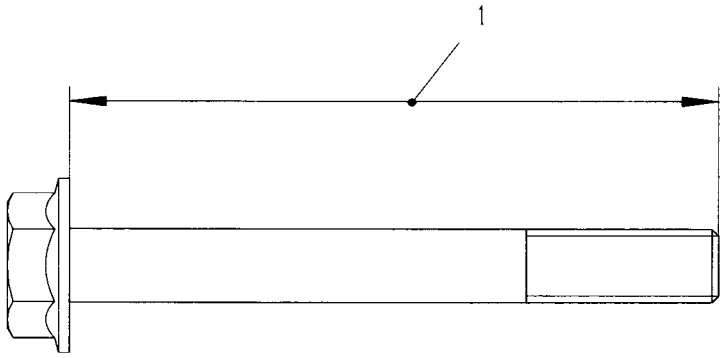
Rocker Shaft Support Screws



K 050 2006 b0

No.	Designation	Stage	Tol. size	Deviation		Clearance		Interference		Wear limit
			Basic size	lower	upper	min.	max.	min.	max.	
1	Screw length - removed		90.000	- 0.200	0					91.000

Note:
Ref. 1: If wear limit has been exceeded: replace screw

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Data Sheets

To ensure that unusable components are not installed or components which can still be used are not discarded all inspection work should only be carried out by qualified personnel using the necessary measuring instruments.
All measuring and testing equipment is naturally subject to wear.
To determine resulting tolerance deviations in good time, the measuring and test equipment must be inspected annually at a location equipped with appropriate technical facilities.
Alternatively, equipment can be inspected by our Product Support Service and MTU, Friedrichshafen, or DDC, or by an external product support service.
Adherence to the limits specified in this Tolerances and Wear Limits List is mandatory.
The following data sheets should be used to record the individual examination results:

- Cylinder liner, installed
- Cylinder liner, upper fit
- Cylinder liner, lower fit
- Cylinder liner, balcony seat
- Main bearing (bearing installed)
- Conrod bearing (bearing shells installed)
- Timing

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Cylinder Liner, Installed

Engine model: .....

Engine No.: .....

Order No.: .....

Crankcase No.: .....

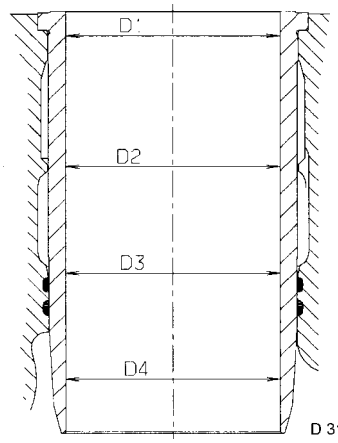
Cylinder liner

Part No.: .....

Specified bore dimension: .....

To measure: In measurement direction a (direction of travel) and b (transverse).

Measurement plane D1 – D2 – D3 – D4



Cyl. No.	Measurement direction	Basic dimension	Actual dimensions Measuring planes				Cyl. No.	Measurement direction	Basic dimension	Actual dimensions Measuring planes			
			D1	D2	D3	D4				D1	D2	D3	D4
A1	a						B1	a					
	b							b					
A2	a						B2	a					
	b							b					
A3	a						B3	a					
	b							b					
A4	a						B4	a					
	b							b					
A5	a						B5	a					
	b							b					
A6	a						B6	a					
	b							b					
A7	a						B7	a					
	b							b					
A8	a						B8	a					
	b							b					
A9	a						B9	a					
	b							b					
A10	a						B10	a					
	b							b					

Remarks:

Date:	.....		Checked by:	.....	

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Cylinder Liner, Upper Fit

Engine model: .....

Engine No.: .....

Order No.: .....

Crankcase No.: .....

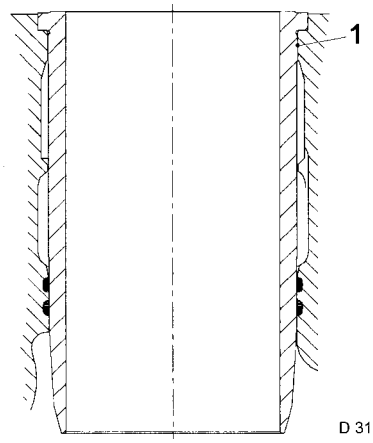
Cylinder liner

Part No.: .....

Specified dimension, upper fit: ..... mm

- Crankcase bore ..... mm
- Cylinder liner OD ..... mm

Specified clearance: ..... mm



Actual dimensions										
Cylinder No.		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
1	Crankcase bore										
	Cylinder liner OD										
	Clearance/overlap										

Actual dimensions										
Cylinder No.		B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
1	Crankcase bore										
	Cylinder liner OD										
	Clearance/overlap										

Remarks:

Date:	.....		Checked by:	.....	

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Cylinder Liner, Lower Fit

Engine model: .....

Engine No.: .....

Order No.: .....

Crankcase No.: .....

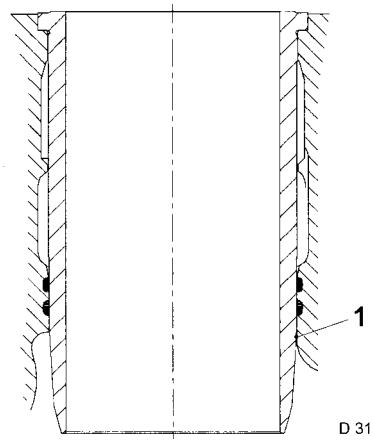
Cylinder liner

Part No.: .....

Specified dimension, lower fit: ..... mm

- Crankcase bore ..... mm
- Cylinder liner OD ..... mm

Specified clearance: ..... mm



Actual dimensions										
Cylinder No.		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
1	Crankcase bore										
	Cylinder liner OD										
	Clearance/overlap										

Actual dimensions										
Cylinder No.		B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
1	Crankcase bore										
	Cylinder liner OD										
	Clearance/overlap										

Remarks:

Date:	.....		Checked by:	.....	

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Cylinder Liner, Balcony Seat

Engine model: _____

Engine No.: _____

Order No.: _____

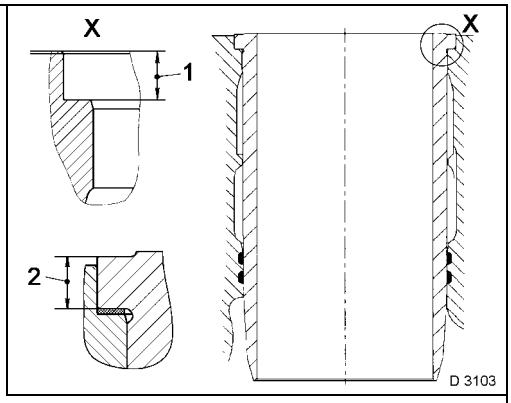
Crankcase No.: _____

Cylinder liner

Part No.: _____

Specified dimension:

- Crankcase, deep recess _____ mm
- Cylinder liner, collar thickness _____ mm



Actual dimensions										
Cylinder No.		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
1	Crankcase, deep recess										
2	Cylinder liner, collar thickness										

Actual dimensions										
Cylinder No.		B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
1	Crankcase, deep recess										
2	Cylinder liner, collar thickness										

Remarks:

Date:	.....		Checked by:	.....	

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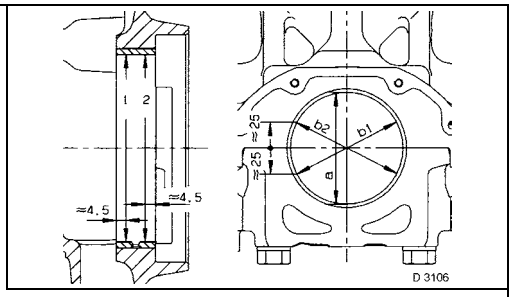
Main Bearing (Bearing Installed)

Engine model: .....
Engine No.: .....
Order No.: .....
Crankcase No.: .....
Crankshaft No.: .....

Measurement and Entry:
Diameter a, b1 and b2
Measuring planes 1 and 2
Determining bearing clearance:
One-part bearing:
Min. dimension a, b1 or b2
Standard:
Min. dimension a



Free end: Crankshaft bearing — Specified dia.: _____ mm

Drive flange — Specified dia.: _____ mm

Driving end: Crankshaft bearing — Specified dia.: _____ mm

Drive flange — Specified dia.: _____ mm

Main bearing: Specified dia.: _____ mm

Crankshafts Specified dia.: _____ mm

Radial clearance:

Free end:	_____	mm (min.)	.....	mm (max.)
Driving end:	_____	mm (min.)	.....	mm (max.)
Main bearing:	_____	mm (min.)	.....	mm (max.)

Crankshaft axial clearance: _____ mm (min.) _____ ..... mm (max.) Actual dimension: ..... mm

Actual dimensions

Bearing No.		1	2	3	4	5	6	7	8	9	10
Bearing dia. **b1**	1										
	2										
Bearing dia. **b2**	1										
	2										
Bearing dia. **a**	1										
	2										
Crankshaft dia. (actual dimension)											
Bearing clearance (radial)											

Remarks:

Date: ..... Checked by: .....

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Conrod Bearing (Bearing Shells Installed)

Engine model: .....
Engine No.: .....
Order No.: .....
Crankcase No.: .....
Crankshaft No.: .....

Specified dimensions:

- Conrod bearing bore _____ mm
- Radial clearance min.: _____ mm
  max.: _____ mm

Conrod, A bank

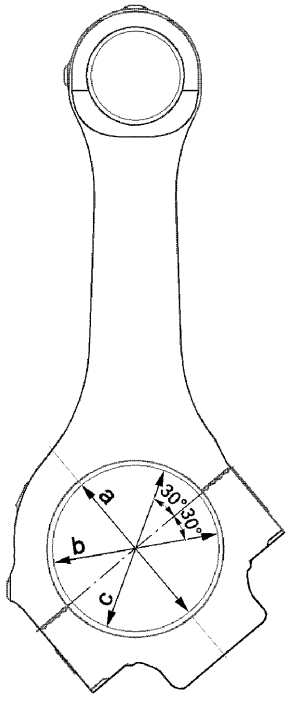
Cyl. No.	Rod No.	Batch	Actual dimensions, dia. Basic dimension	a	b	c	Crankshaft	Radial clearance
				a	**b**	**c**		
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

To measure:
Diameter a, b, c

To determine clearance
Min. dimension a, b or c

Conrod, B bank

Cyl. No.	Rod No.	Batch	Actual dimensions, dia. Basic dimension	a	b	c	Crankshaft	Radial clearance
				a	**b**	**c**		
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								



D 3105

Remarks:

Date: ..... Checked by: .....

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Timing

Engine model: .....

Engine No.: .....

Order No.: .....

1. Timing Diagram:

	Specified in °		Tolerance	Actual Cylinder No.									
				A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
Exhaust valve opens before BDC		±											
Inlet valve opens before TDC		±											
Exhaust valve closes after TDC		±											
Inlet valve closes after BDC		±											

	Specified in °		Tolerance	Actual Cylinder No.									
				B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Exhaust valve opens before BDC		±											
Inlet valve opens before TDC		±											
Exhaust valve closes after TDC		±											
Inlet valve closes after BDC		±											

Settings for valve timing correspond to the adjustment diagram

2. Cam Lift/Valve Lift:

	Specified in mm		Tolerance	Actual Cylinder No.									
				A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
Exhaust		±											
Inlet		±											

	Specified in mm		Tolerance	Actual Cylinder No.									
				B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Exhaust		±											
Inlet		±											

3. Injection Timing:

For start of delivery, see engine master card

Remarks:

Date:	.....		Checked by:	.....	

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