

## Data

Crankshaft standard dimension and repair stages	Crankshaft bearing journal diameter	Width of thrust bearing journal	Crank pin diameter	Width of pins
Standard dimension	63.965	27.000	51.965 <sup>1)</sup> 47.965 <sup>2)</sup>	50.000
	63.950	27.021	51.945 47.945	50.100
1st repair stage	63.715 63.700	up to 27.50	51.715 <sup>1)</sup> 47.715 <sup>2)</sup> 51.695 47.695	up to 50.30
2nd repair stage	63.465 63.450		51.465 <sup>1)</sup> 47.465 <sup>2)</sup> 51.445 47.445	
3rd repair stage	63.215 63.200		51.215 <sup>1)</sup> 47.215 <sup>2)</sup> 51.195 47.195	
4th repair stage	62.965 62.950		50.965 <sup>1)</sup> 46.965 <sup>2)</sup> 50.945 46.945	
Permissible crankshaft journal and crank pin runout				0.0025
Permissible deviation of the connecting rod journal surface axis to the reference axis of the crankshaft journals I and V, from parallel				0.01
Permissible radial runout of the rear crankshaft flange <sup>3)</sup>				0.02
Permissible axial runout of the rear crankshaft flange <sup>3)</sup>				0.012
Permissible axial runout of the crankshaft bearing journals <sup>3)</sup>		Journals II, IV	0.07	
		Journals III	0.10	
Permissible deviation of the front crankshaft journal <sup>4)</sup>		from the cylindrical shape	0.005	
		from axial runout <sup>3)</sup>	0.030	
Permissible deviation of the bearing surfaces of the thrust bearing		from radial runout <sup>3)</sup>	0.02	
Fillet radii at the crankshaft and connecting rod bearing journals				2.5-3
Crankshaft bearing journal diameter front				31.984-32.000
Bearing surface dia. for radial sealing ring rear, ground without helix				99.928
				99.874
Scleroscope hardness of crankshaft bearing journals and crank pins		when new	71-81	
		limit value	60 <sup>5)</sup>	

1) Engines 116 and 117 except 2).

2) 116.960/961 (AUS) (J) (S) (USA) 116.962/963 and 117.962/963.

3) With crankshaft resting on outer crankshaft bearing journals I and V and one full turn.

4) When measuring in the installed position, eliminate end float by pressing against the crankshaft journal.

5) Limit value should be available at least on 2/3 of journal circumference.

## Special tool

Impact hardness tester (scleroscope)



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## Note

During repair the crankshaft need not be balanced.

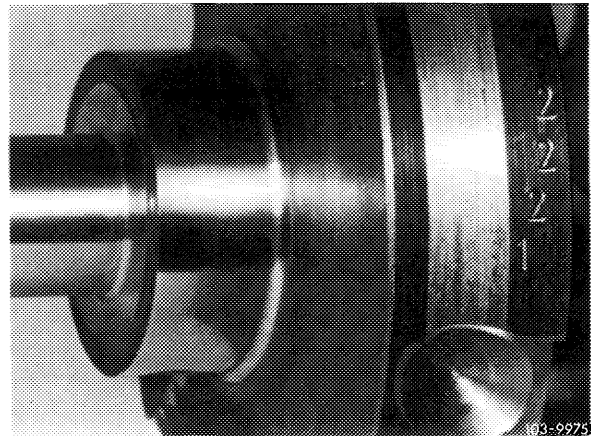
When checking and reconditioning the crankshaft proceed according to the following diagram.

Group number for crank pin diameter (standard dimension)

1 = 51.945–51.954 mm and 47.945–47.954 mm

2 = 51.955–51.965 mm and 47.955–47.965 mm

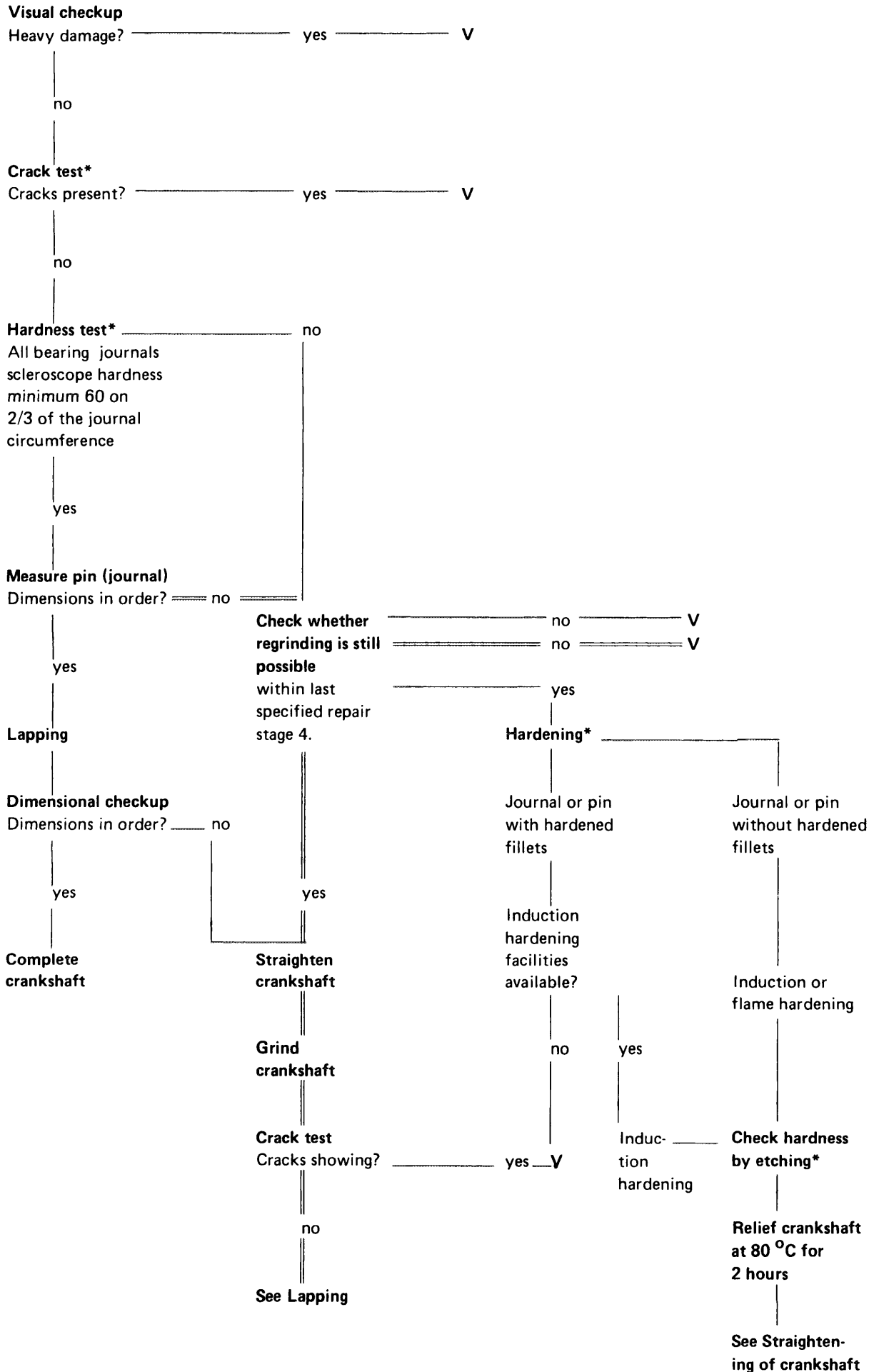
The stamped-in figure at bottom applies to the 1st crank pin.



## Diagram

\* See section „Explanation on diagram“.

V = Scrapping.



## Explanation of diagram

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### Crack test

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Clean crankshaft. Bearing journals and pins should be free of oil and grease. Magnetise crankshaft and apply fluorescent powder (fluxing). A color penetration method may also be used (immersion in bath or using spray can).

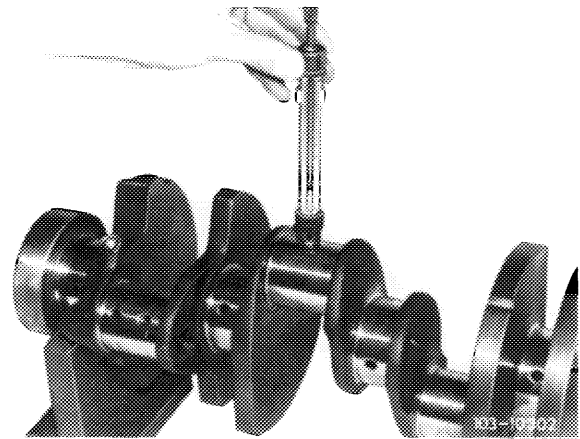
Flux agent: Paint or UV-oil,  
cleaning agent,  
developer

### Hardness test

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Test hardness with impact hardness tester (scleroscope).

The minimum hardness should be available on 2/3 of the journal and pin circumference.

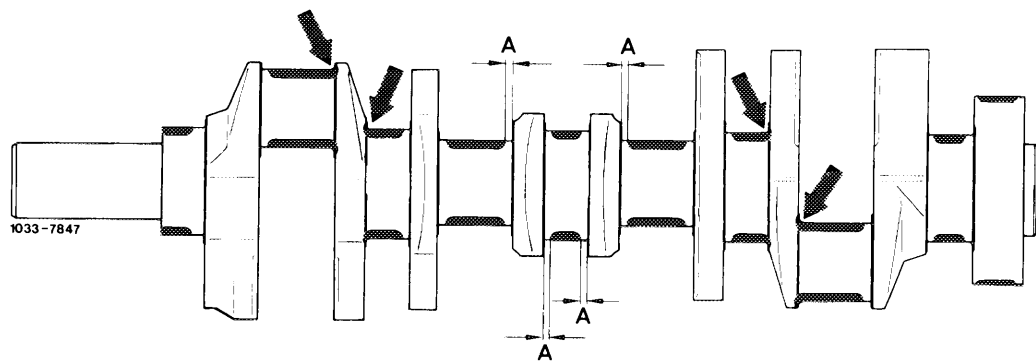


### Hardening

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Journals and pins without hardened fillets can be inductance hardened or flame hardened. On the other hand, journals and pins with hardened fillets (arrow) must always be inductance hardened. If this is not possible, scrap the crankshaft.

When hardening journals and pins without hardened fillets, the distance A between hardened runout and fillet radius (4–5 mm) must be maintained.



The running surface for the rear radial sealing ring is hardened and ground without helix (previously 60° helix).

## **Checking the hardening results**

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For perfect hardening, check adjustment of hardening equipment by means of metallographic etching (grinding).

Pertinent tests can be made with scrapped crankshafts.

Check hardening by etching surface of journals and pins with a 2% solution of alcoholic nitric acid ( $\text{HNO}_3$ ).

No dark areas should appear on journal or pin surfaces.

Unhardened fillets will become dark.

Hardened fillets, on the other hand, should be as bright as the surface of pin or journal.

A journal or pin which has already passed metallographic inspection may be used for comparison.

After the test, carefully wash off nitric acid with alcohol.

## **Corrosion protection**

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Crankshafts which are not immediately installed again should be lubricated with engine initial operation oil (SAE 30).