

**03—318 Checking and reconditioning of crankshaft**

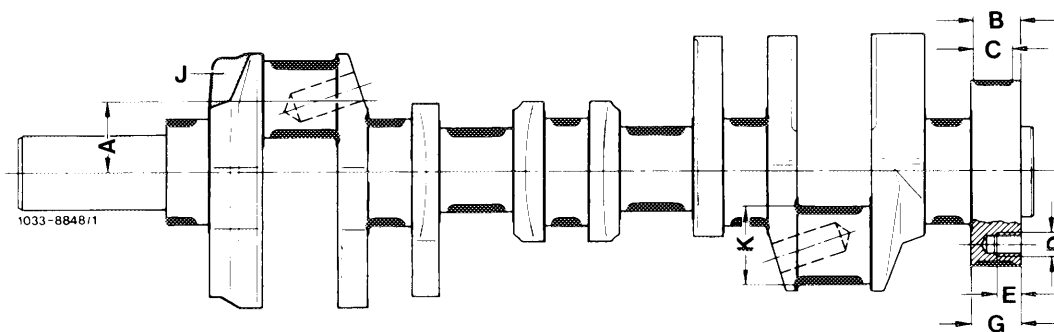
**Data**

Crankshaft standard dimension and repair stages	Crankshaft bearing journal dia.	Width of journal at fitted bearing	Crankpin dia.	Width of pins
Standard dimension	$\frac{63.96}{63.95}$	$\frac{27.00}{27.02}$	$\frac{51.96}{51.95}$	$\frac{50.00}{50.12}$
1st repair stage	$\frac{63.71}{63.70}$	up to 27.50	$\frac{51.71}{51.70}$	up to 50.30
2nd repair stage	$\frac{63.46}{63.45}$		$\frac{51.46}{51.45}$	
3rd repair stage	$\frac{63.21}{63.20}$		$\frac{51.21}{51.20}$	
4th repair stage	$\frac{62.96}{62.95}$		$\frac{50.96}{50.95}$	
Permissible radial runout of crankshaft journals and crankpins				0.0025
Permissible deviation of surface line of crankpins in relation to reference axis of crankshaft journals I and V, from parallel				0.01
Permissible radial runout of rear crankshaft flange <sup>3)</sup>				0.02
Permissible axial runout of rear crankshaft flange <sup>3)</sup>				0.012
Permissible radial runout of crankshaft journals <sup>3)</sup>			journal II, IV	0.07
			journal III	0.10
Permissible deviation of front crankshaft journal <sup>2)</sup>			from cylindrical shape	0.05
			radial runout <sup>3)</sup>	0.03
Permissible deviation of running surfaces of thrust bearing			axial runout <sup>3)</sup>	0.02
Fillets on crankshaft journals and crankpins				2.5—3
Crankshaft journal dia. front				31.984—32.000
Running surface dia. for radial sealing ring rear, ground free of twist				$\frac{99.928}{99.874}$
Scleroscope hardness of crankshaft journals and crankpins			value when new	71—81
			limit value	61 <sup>1)</sup>

<sup>1)</sup> The limit value should be available at least at 2/3 of journal and crankpin circumference.

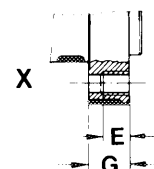
<sup>2)</sup> When measuring in installed condition, eliminate radial bearing play by pushing against crankshaft journal.

<sup>3)</sup> With crankshaft resting on outer crankshaft bearing journal I and V and at one full turn.



The differentiating characteristics of crankshafts of engines 116 and 117 are shown on drawing and in table.

Starting with installation of transmission 722.3 (W 4 A 040) into model 107.026 the crankshaft of engine 117.960 is standardized with that of engine 117.961.



### Crankshafts engines 116 and 117

Engine	A (stroke)	C	E	G	J	K	Part no. of crankshaft	Interchangeable with
116.960/961	35,9 (71,8)	13	13 <sup>1)</sup>	19	with-out	52	116 031 16 01	--
116.960 116.961 116.962/963	39,45 (78,9)					48	116 031 22 01	--
116.98 1st version	32,9 (65,8)					21	13 <sup>2)</sup>	26
116.98 2nd version		116 031 20 10	116 031 14 01					
117.960 1st version <sup>3)</sup>	42,5 (85)	13	13 <sup>1)</sup>	19	with-out	52	117 031 12 01 <sup>3)</sup>	--
117.960 2nd version 117.961						117 031 14 01	--	
117.962 117.963						48	117 031 21 01	--
117.98 1st version		21	13 <sup>2)</sup>	26	with	52	117 031 10 01	117 031 18 01
117.98 2nd version		13					117 031 18 01	117 031 10 01

<sup>1)</sup> Throughbore.

<sup>2)</sup> Blind hole bore.

<sup>3)</sup> In the event of repairs, the shorter crankshaft 117 031 14 01 can be installed instead of crankshaft 117 031 13 01, together with a length compensating washer, part no. 116 032 03 76, (10.5 mm thick) and the longer (29 mm, up to now 23 mm) necked-down screws, part no. 116 032 04 71.

## Special tool

Hardness tester (Scleroscope)



000 589 20 21 00

## Note

Following repairs, no balancing of crankshaft is required.

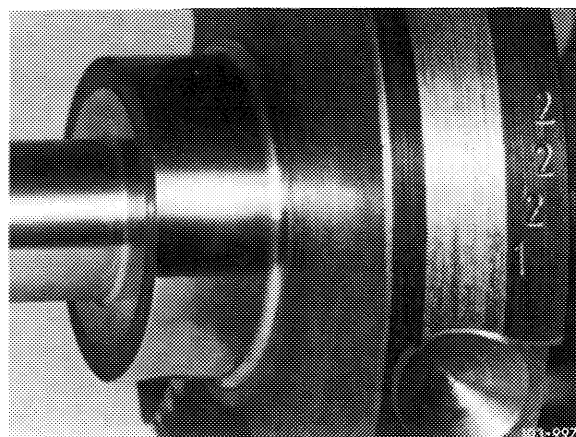
When checking and reconditioning crankshaft, proceed in sequence of diagram below.

Group number for crankpin dia. (standard dimension)

1 = 51.945–51.954 mm or 47.945–47.954 mm

2 = 51.995–51.965 mm or 47.955–47.965 mm

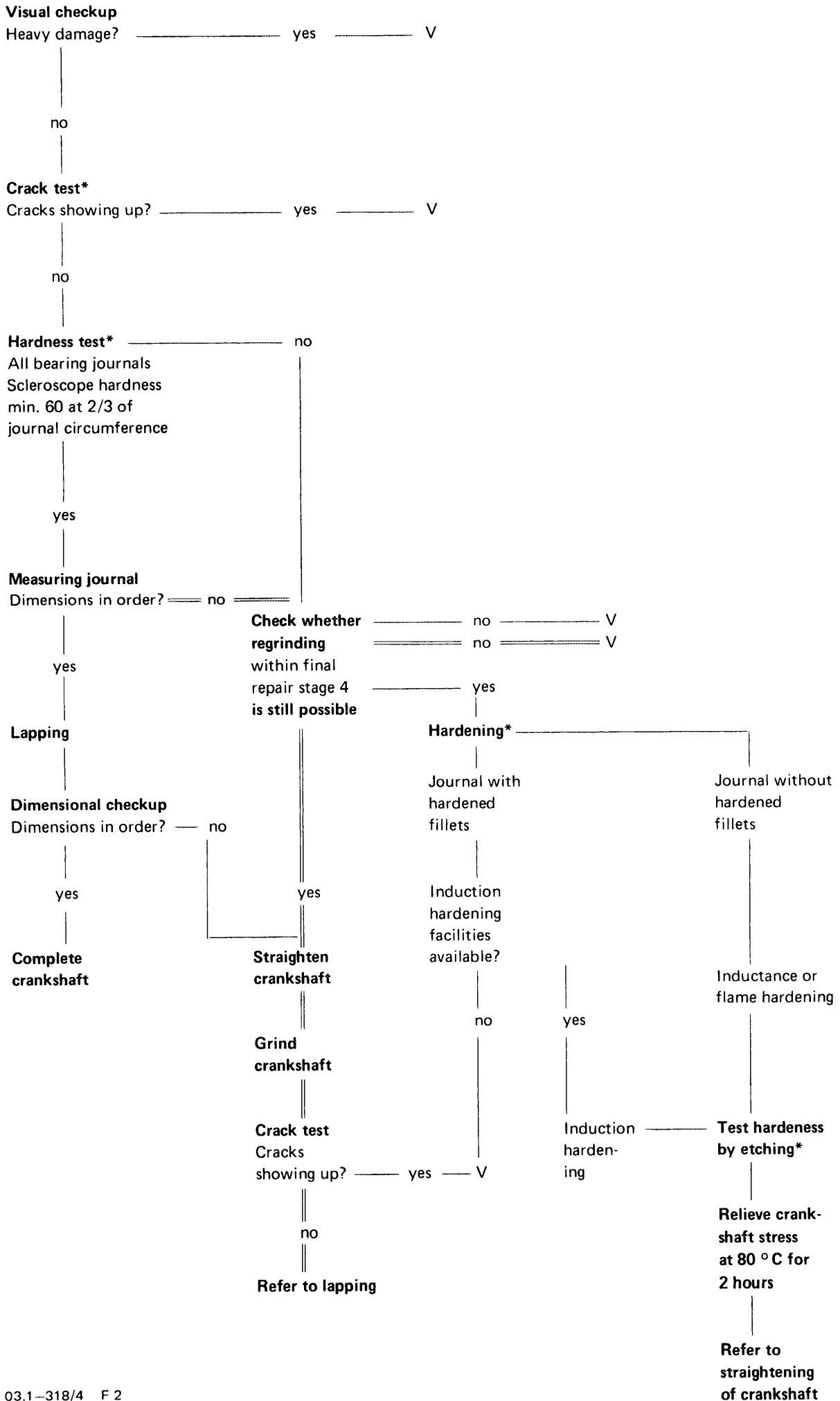
The number punched in at bottom applies to 1st crankpin.



## Diagram

\* Refer to section "Explanations concerning diagram".

V = scrap.



## Explanations concerning diagram

---

### Crack test

---

Clean crankshaft. Journals should be free of oil and grease. Magnetize crankshaft and apply fluorescent powder (fluxing). A color penetration test (immersion in bath or using spray can) can also be applied.

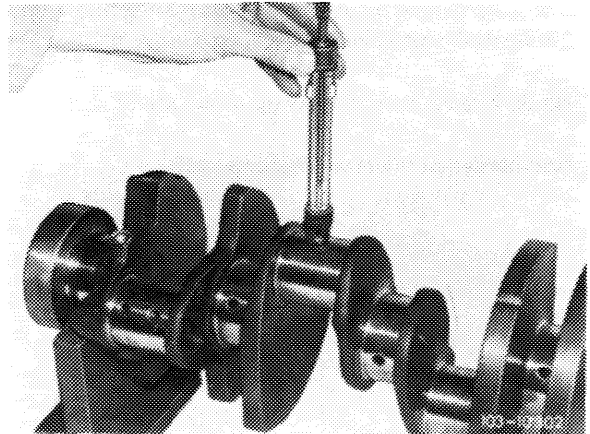
Aids: Paint or UV-oil,  
cleaning agent,  
developer

### Hardness test

---

Check hardness with Scleroscope.

The minimum hardness should prevail at 2/3 of journal circumference.

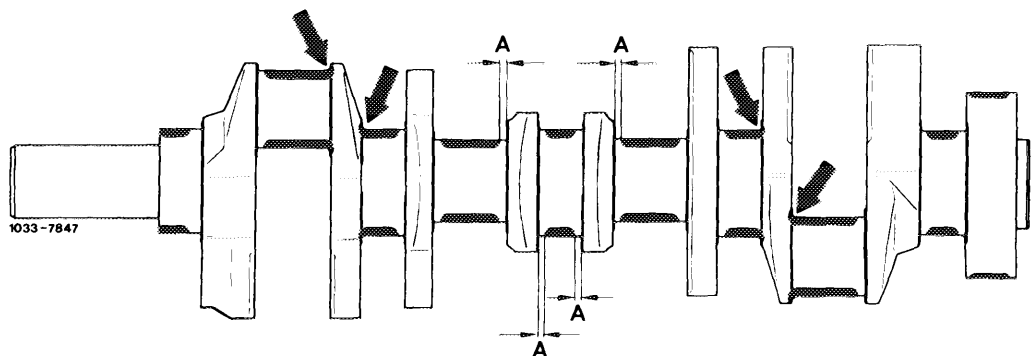


### Hardening

---

Journals without hardened fillets can be induction-hardened or flame-hardened. Journals with hardened fillets (arrow) should be induction-hardened on principle. If this is not possible, scrap crankshaft.

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



## **Checking the hardening**

---

For perfect hardening, check adjustment of hardening equipment by metallographic grinding.

Pertinent tests can be made on scrapped crankshafts.

Check hardening by etching the journal surface with a 2% alcoholic nitric acid ( $\text{HNO}_3$ ) solution.

No dark spots should show up at surface of journal.

Non-hardened fillets will become dark.

The hardened fillets, on the other hand, should be as bright as the journal surface.

For comparison, we recommend an etching test on a metallographically inspected journal.

Then, carefully wash off nitric acid by means of alcohol.

## **Corrosion protection**

---

Coat crankshafts which are not immediately installed again with engine initial operation oil (SAE 30).