



**CARS**

Part 4 (45)

PROPELLER SHAFT

P 120, 14-series, P 1800

# **SERVICE MANUAL**

## CONTENTS

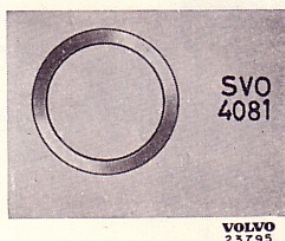
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## SPECIFICATIONS

Type .....	Tubular, divided, three universal joints, support bearing
Universal joints, make and type .....	Hardy-Spicer with needle bearings
Lubricant, early prod. ....	Chassis grease
"    , late prod. sliding joint (when assembling) .....	Grease mixed with molybdenum-disulphide
Universal joints .....	Lubricated with chassis grease when being assembled. Subsequent greasing not required.

## TOOLS

The following tool is required for repair work on the propeller shaft.



SVO 4081. Ring support bearing in retainer (support bearing, early prod.)

## DESCRIPTION

The propeller shaft is of the divided, tubular type, see Figs. 1—3. The rear end of the front section of the propeller shaft is in the form of a splined sleeve. In this there is a splined shaft which also forms one of the yokes on the intermediate universal joint. The early prod. type of front and rear universal joint was carried directly in yokes

on the flange of the gearbox and rear axle respectively, see Fig. 1. The late prod. types are fitted with flange yokes, see Figs. 2 and 3. All three types of propeller shafts can be used in the P 120 and P 1800 models, but only type III can be used for the 14-series.

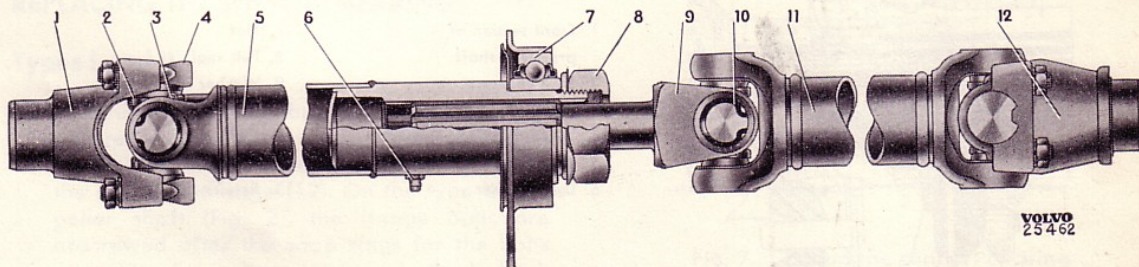
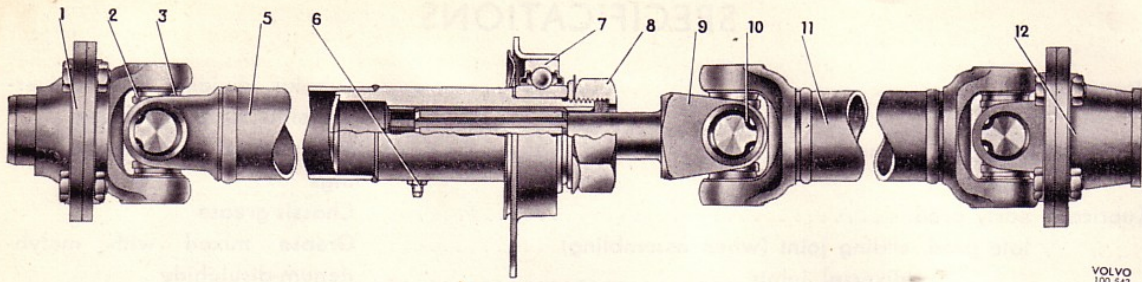


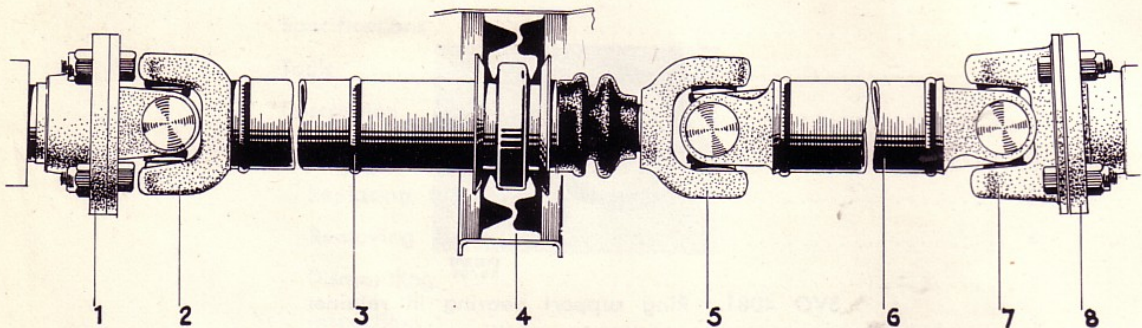
Fig. 1. Propeller shaft, type I (see Fig. 2 for reference to numbers above)



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Fig. 2. Propeller shaft, type II

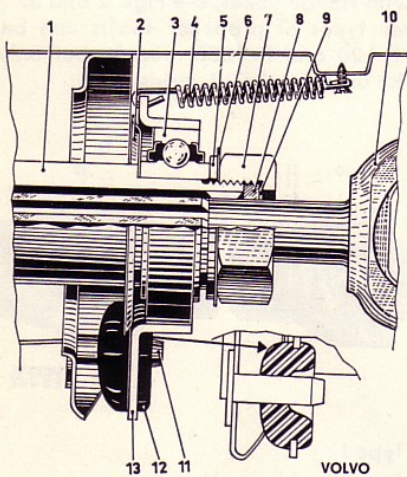
- |                                    |                                     |                                     |
|------------------------------------|-------------------------------------|-------------------------------------|
| 1. Flange on gearbox               | 5. Front section of propeller shaft | 9. Splined shaft                    |
| 2. Universal joint                 | 6. Grease nipple                    | 10. Snap ring                       |
| 3. Grease nipple                   | 7. Support bearing                  | 11. Rear section of propeller shaft |
| 4. Clamp (early prod., see Fig. 1) | 8. Nut                              | 12. Flange on rear axle             |



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Fig. 3. Propeller shaft, type III

- |                                     |                                    |
|-------------------------------------|------------------------------------|
| 1. Flange on gearbox                | 5. Intermediate universal joint    |
| 2. Front universal joint            | 6. Rear section of propeller shaft |
| 3. Front section of propeller shaft | 7. Rear universal joint            |
| 4. Support bearing                  | 8. Flange on rear axle             |



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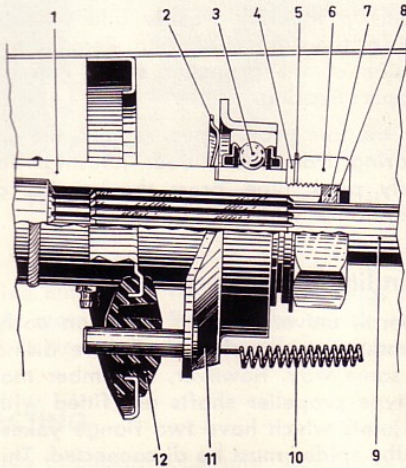
Fig. 4. Support bearing, type I

- |                                     |                   |
|-------------------------------------|-------------------|
| 1. Front section of propeller shaft | 7. Nut            |
| 2. Dust cover                       | 8. Felt seal      |
| 3. Ball bearing                     | 9. Washer         |
| 4. Tension spring                   | 10. Splined shaft |
| 5. Thrust washer                    | 11. Pin           |
| 6. Lock washer                      | 12. Rubber bush   |
|                                     | 13. Retainer      |

The rear end of the front section of the propeller shaft is carried in a ball bearing, see Figs. 4–6. For types I and II, the ball bearing is carried in a bearing housing suspended by two trunnions and two rubber bushes, see Figs. 4 and 5. For type III, the ball bearing is housed in a rubber cover secured to the propeller shaft tunnel by a cap, see Fig. 6.

The propeller shaft is fitted with three universal joints. Each joint consists of a spider with four ground trunnions which are carried in the yokes by means of needle bearings.

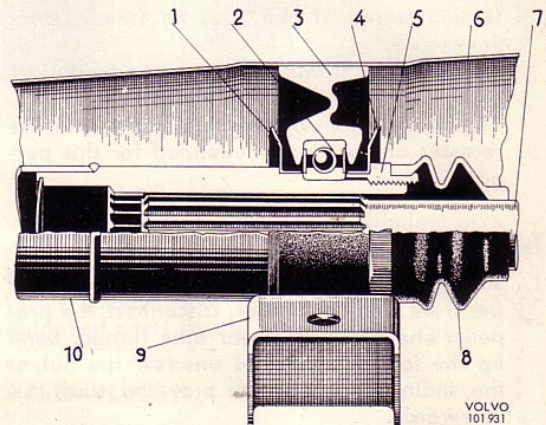
The early prod. type universal points and sliding joints were provided with grease nipples for lubrication. The late prod. types are lubricated only at assembly.



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Fig. 5. Support bearing, type II

1. Front section of propeller shaft
2. Dust cover
3. Ball bearing
4. Thrust washer
5. Lock washer
6. Nut
7. Felt seal
8. Washer
9. Splined shaft
10. Tension spring
11. Retainer
12. Rubber bush



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Fig. 6. Support bearing, type III

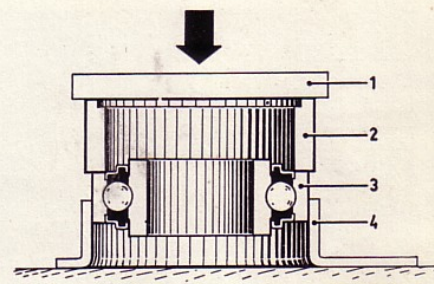
1. Dust cover
2. Ball bearing
3. Rubber housing
4. Dust cover
5. Nut
6. Floor tunnel
7. Splined shaft
8. Rubber cover
9. Cap
10. Front section of propeller shaft

## REPAIR INSTRUCTIONS

### REPLACING THE SUPPORT BEARING

#### Types I and II

1. Jack up the vehicle and block up the front and rear axles. Slacken the clamps (4, Fig. 1) which retain the rear universal joint to the rear axle flange (12). On the type II propeller shaft (Fig. 2), the flange bolts are unscrewed after the snap rings for the bolts and nuts have been removed. Bend back the lock washer and unscrew the nut (8). Pull out the propeller shaft rearwards.



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Fig. 7. Fitting the support bearing

1. Plate
2. Ring SVO 4081
3. Support bearing
4. Retainer

2. Disconnect the snap ring if fitted. Pull out the retainer with support bearing (7) to the rear. Press the support bearing out of the retainer with a suitable drift. With the help of ring SVO 4081, see Fig. 7, press the new bearing into the retainer. If the diameter of the press tool is less than that of the hole in the ring, lay a plate (1, Fig. 7) over the ring.
3. Fit the retainer with the support bearing and rear section of propeller shaft in reverse order to removing. Hook on securely the tension spring, if one is to be fitted. Lower the vehicle.

NOTE. When fitting type I support bearing, make sure that the sheet metal strip (1, Fig. 16) on the rear universal joint fits into the recesses on the flange intended for this purpose.

### Type III

1. Jack up the vehicle and place blocks under the front and rear axles. Disconnect the propeller shaft from the rear axle flange. Bend up the lock washer and unscrew the nut at the sliding joint. Pull the propeller shaft out rearwards.
2. Remove the cap for the support bearing. Pull off the support bearing complete.
3. Prise the old bearing out of the rubber housing. Install the new bearing.
4. Fit the support bearing and other parts in reverse order to removing. If the splined joint appears to be dry, lubricate it with grease mixed with molybdenum-disulphide. Lower the vehicle.

### REMOVING

Jack up the vehicle and place blocks under the front and rear axles. Slacken the clamps and bolts securing the propeller shaft to the gearbox and the rear axle flange respectively. Unhook

the tension spring if fitted. For type III remove the support-bearing cap and then take down the propeller shaft. For types I and II, move the propeller shaft to the rear and remove it.

### DISMANTLING

#### Dismantling the propeller shaft

1. Bend up the lock washer and unscrew the nut for the support bearing. Remove the rear section of the propeller shaft. Pull off the support bearing.
2. For the late prod. types, remove the support bearing from the rubber housing. For the early prod. type, press the bearing out of the retainer with a suitable drift.

#### Dismantling the universal joint

In general, universal joints fitted on early and late prod. type propeller shafts are dismantled in the same way. However, remember that late prod. type propeller shafts are fitted with universal joints which have two flange yokes from which the spider must be disconnected. This also applies to the intermediate universal joint on the early prod. type propeller shaft. See Figs. 1-3.

1. Remove the snap rings retaining the needle bearings in the yokes, see Fig. 8. Remove the grease nipple in the spider.
2. Fix the shaft securely in a vice so that the joint is as near the vice as possible. Remember that the shaft itself is a tube which can easily be deformed.
3. With a hammer and metal drift, drive the spider in one direction as far as it can go. The needle bearing will thereby creep out halfway.
4. Then drive the spider in the same way in the opposite direction as far as it can go, see Fig. 9.

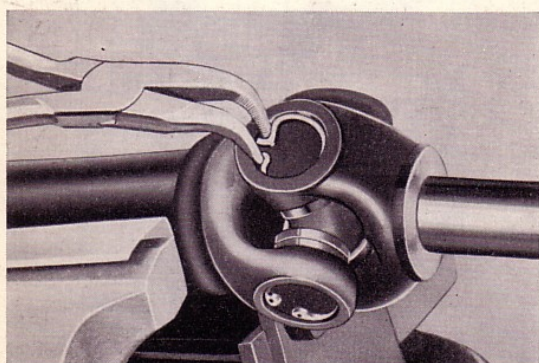
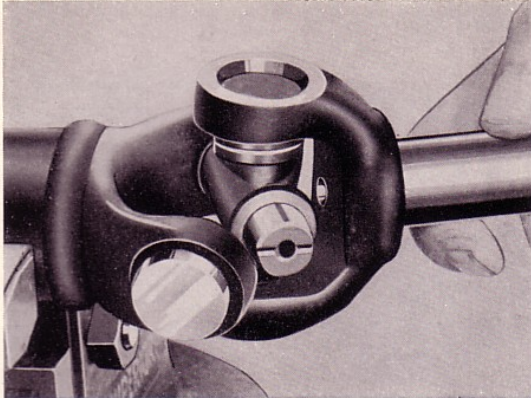


Fig. 8. Removing the snap ring

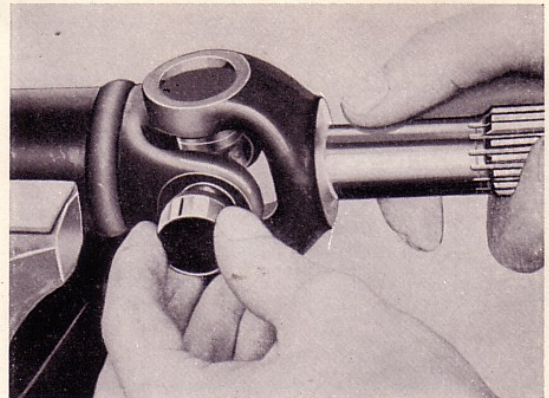


Fig. 9. Removing the spider, I



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Fig. 10. Removing the spider, II



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Fig. 11. Fitting the spider

5. Drive out one of the needle bearings with a light metal drift. Remove the spider, see Fig. 10. Drive out the other needle bearing.

### INSPECTING

It is very important to ensure that the propeller shaft is straight. Since even minor damage on a propeller shaft can cause vibration, very careful inspection must be made.

The shaft should be set up between centres and checked along its entire length with an indicator gauge while it is rotating. If it is out-of-true by more than 0.25 mm (0.010"), the shaft must be replaced.

**NOTE.** No attempt should be made to straighten a damaged propeller shaft, it must be replaced with a new one.

Check the support bearing by pressing the bearing races against each other with the hands and turning them in opposite directions. The bear-

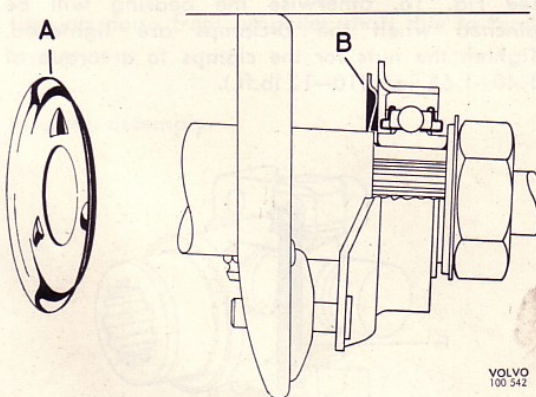
ing should run easily without binding at any point. If it does not do so, scrap the bearing and replace it with a new one.

Check needle bearings and spiders. Worn or damaged parts should be replaced.

### ASSEMBLING

#### Assembling the universal joints

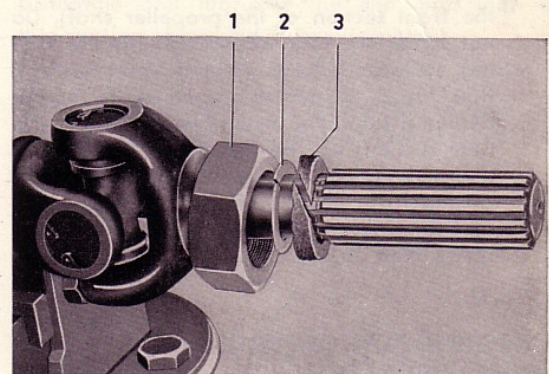
1. Fit new washers on the spider trunnions. Fit the spider in the flange yoke.
2. Fill the bearings halfway with grease. Then push over the spider in one direction and set needle bearing on the trunnion, see Fig. 11. Press in the needle bearing so far that the snap ring can be fitted. Use a drift having a diameter slightly less than that of needle bearing sleeve.
3. Fit the other needle bearing and snap ring in the same way. Fitting of the spider in the other yoke also takes place in the same way.



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Fig. 12.

- A. Dust cover, late prod.
- B. Dust cover, fitted



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Fig. 13. Lock nut for support bearing, early prod.

1. Nut
2. Washer
3. Felt washer

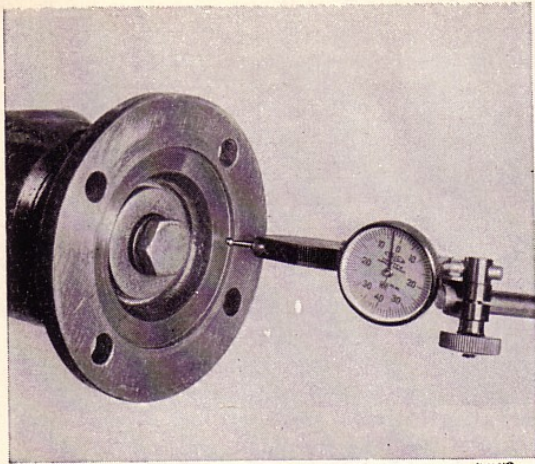


Fig. 14. Checking for out-of-true

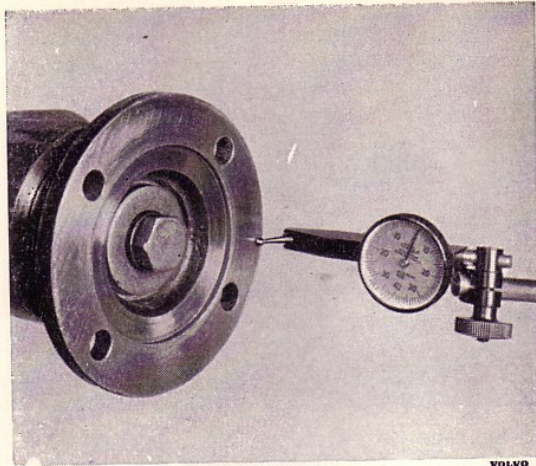


Fig. 15. Checking the warp

### Assembling the propeller shaft

#### 1 a. Types I and II:

Press the support bearing (7, Figs. 1 and 2) in the retainer with ring SVO 4081, see Fig. 7. Fit the dust cover, support bearing, thrust washer and lock washer on the front section of the propeller shaft. If the dust cover is of the early prod. type, it should be replaced by a late prod. type with a registering outer diameter and enlarged holes for the radius transition, see Fig. 12.

#### 1 b. Type III

Place the support bearing in the rubber housing. Then fit the support bearing and dust covers on the front section of the propeller shaft.

2. Fit the nut, washer and felt washer on the splined shaft, if the nut is of the type shown in Fig. 13. If it is the type with rubber bellows, it can be screwed directly onto the front section of the propeller shaft. Do not forget the lock washer. Smear the sliding surfaces of the splined shaft with a thin layer of grease mixed with molybdenum-disulphide. Assemble the front and rear sections of the propeller shaft. When assembling, it is important that the yoke on the front section of the propeller shaft and the yoke on the splined shaft are correctly lined up, see Figs. 1-3.

### CHECKING FLANGES WITH DIAL INDICATOR GAUGE

If there are complaints concerning vibrating propeller shaft, the flanges of types II and III propeller shafts should be checked with a dial indi-

cator gauge. For this purpose, it is advisable to use a tilting indicator gauge which is placed against the flange as shown in Fig. 14. The out-of-true must not exceed 0.07 mm (0.0028"). The maximum permissible warp is 0.09 mm (0.0035"), which is checked as shown in Fig. 15. NOTE. The flanges should be checked after they have been fitted on their shafts. Flanges which do not meet the above requirements must be scrapped.

### INSTALLING

Installing is done in the reverse order to removing. Hook on the tension spring if fitted.

**NOTE. Only type I.** On the front and rear universal joints, there is a sheet metal strip which holds together two of the needle bearings. When fitting, make quite sure that this strip locates properly in the recesses in the respective flanges, see Fig. 16, otherwise the bearing will be pinched when the U-clamps are tightened. Tighten the nuts for the clamps to a torque of 1.40-1.65 kgm (10-12 lb.ft.).

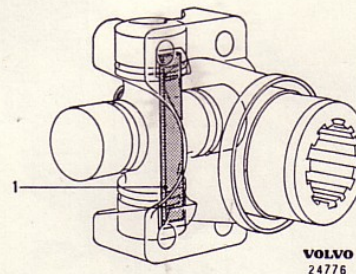


Fig. 16. Fitting the needle bearing (early prod.)

1. Sheet metal strip

## FAULT TRACING

Any trouble occurring in the propeller shaft and the universal joints usually consists of noise caused by vibration and thumping or clicking sounds. No attempt should be made to repair or straighten a broken or damaged propeller shaft, but a new one should always be fitted. Vibration can be due to wear, insufficient lubrication or faulty assembly.

Vibration can be heard in the form of a growling noise which becomes louder as the speed increases. If the universal joints are worn, there will be clearly audible clicking sounds when the car is driven slowly and the accelerator pedal alternately depressed and released.

FAULT	
Reason	Remedy
Support bearing housing loose on locating pins.	Replace the rubber bushes.
Support bearing dry or worn.	Replace the bearing.
Support bearing loose in housing.	Replace the bearing and housing.
Needle bearings in universal joints dry or worn.	Lubricate with chassis grease or replace.
The sheet metal strip for the needle bearings on the front or rear universal joints is incorrectly fitted. (Early prod. only.)	Fit the strip correctly, see Fig. 16.
Clamps on yokes loose. (Early prod. only.)	Replace the spring washers and tighten the nuts.
Propeller shaft bent.	Replace the propeller shaft.
Clicking noise from propeller shaft due to binding splines.	Dismantle and lubricate the slip joint with a thin coating of molybdenum disulphide.
Incorrect assembly.	Study the instructions for assembling and installing. Compare the relative positions of the universal joints with Figs. 1-3.





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