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## #61- Electrical: spade connectors

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## #62- Front axle: bearing replacement

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## #63- Engine: sump plate stud length

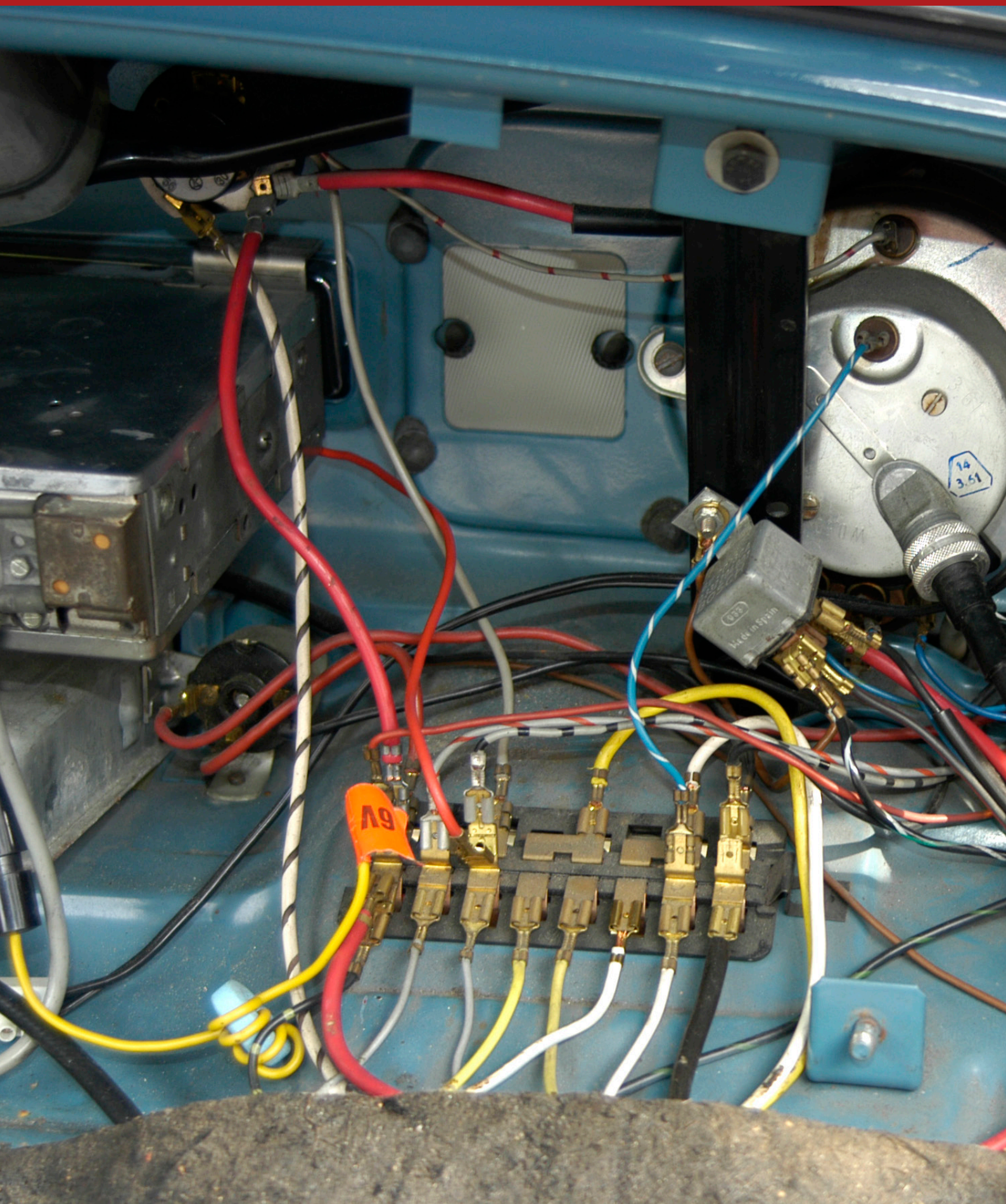
*page 38*





# #61

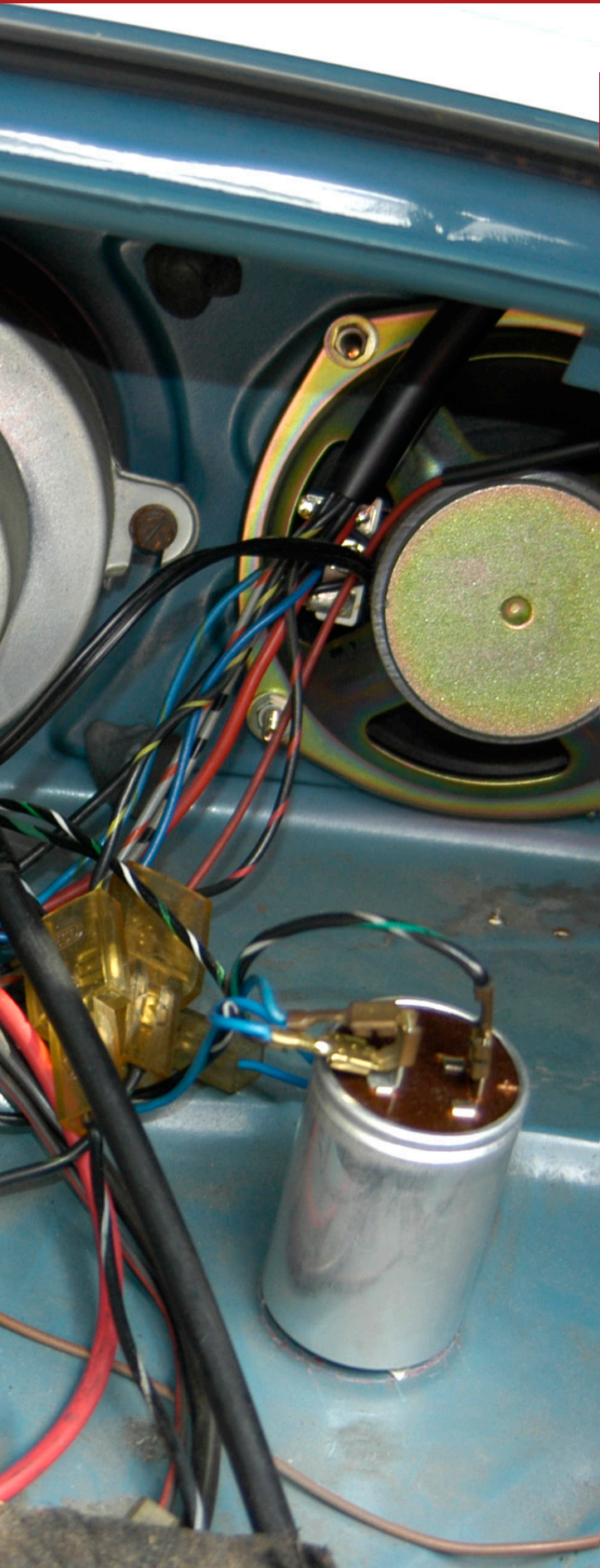
# Electrical





# spade connectors

## Introduction

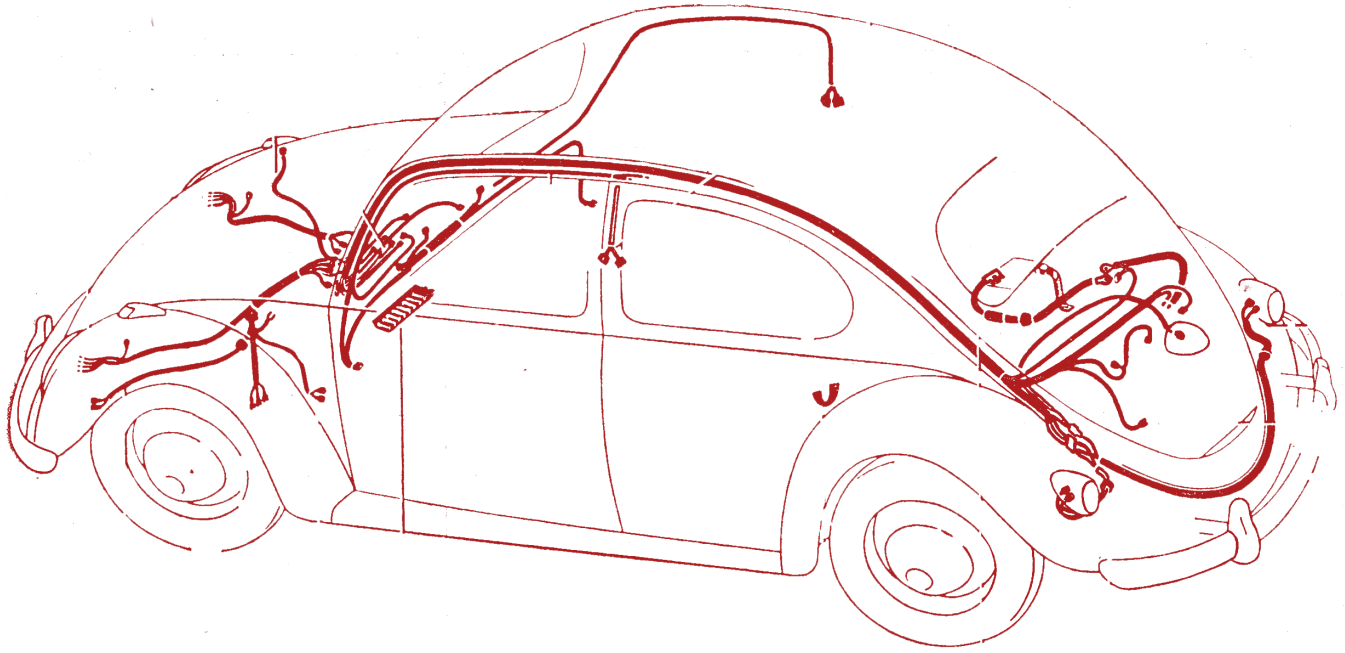


The wiring harness (wiring loom) of our classic Volkswagen is essential for the proper functioning of the engine and accessories. Unfortunately, most old VWs were badly maintained over the years, the electric circuit has in many cases been the victim of maltreatment. Previous owners have wanted to add or modify accessories, have carried out quick repairs to the cables and connections, or have demolished entire parts. In California cars the cabling is hardened by the inexhaustible sun or in most VW's the engine cabling is unusable because the engine ran too hot.

The cabling of our 1960 VW 1200 in the background is as you would like to see it with all classic VW's, especially when you have a 6 volts installation that needs every tenth volt to perform well.

For this series about repairing the wiring loom we start by discussing the spade connectors used to connect alle parts of the electrical circuit.

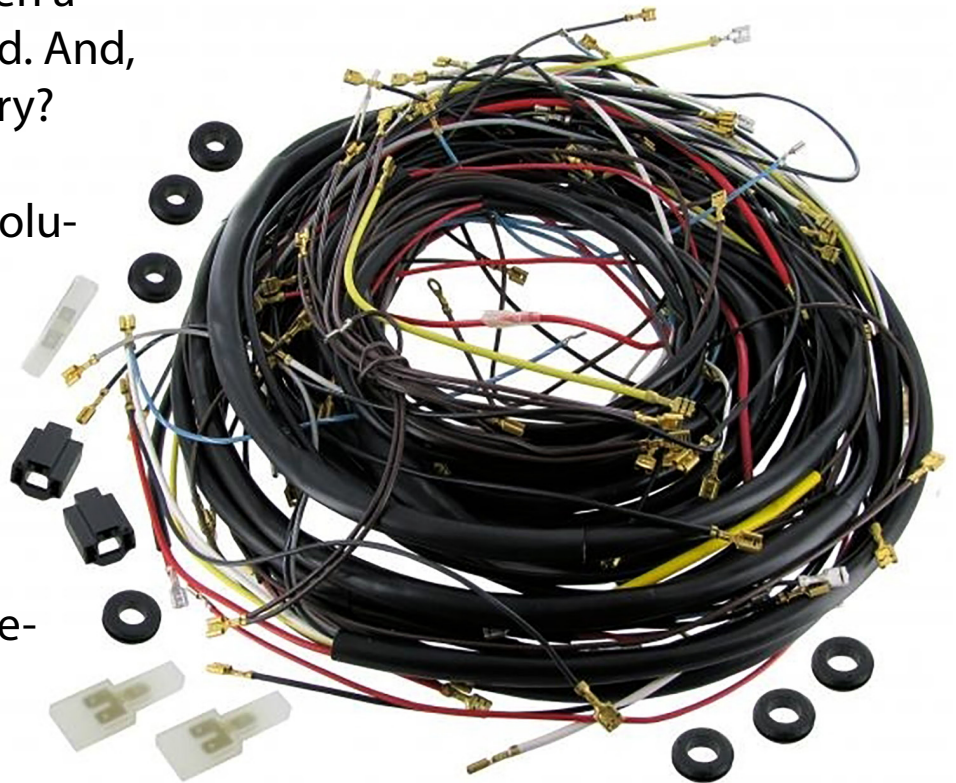




Replacing the complete wiring loom seems the most obvious solution. We have them all in stock for every type of VW. But this is a very drastic job that you will probably only do when a total restoration is at hand. And, is it really always necessary?

You can do all this yourself, provided you use the right materials and tools.

There's an intermediate solution to repair damaged cabling. In particular, replacing damaged or missing spade connector, replacing cracked insulation sleeves and heat shrink sleeves, and replacing entire cable sections.





# spade connectors

You will come across all kinds of terminals that have been added to the electrical circuit of your VW over the years. Some are not suitable, too thick, or are too loose so a lot of the voltage is getting lost along the way.

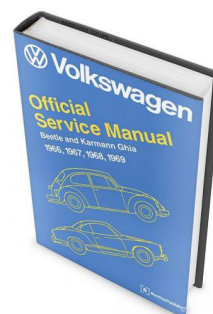
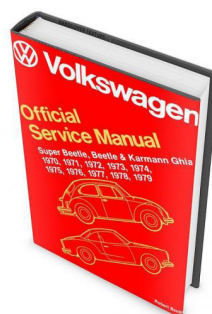
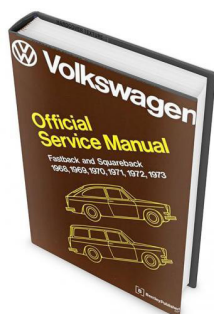
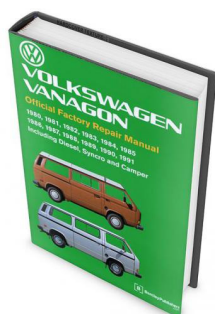
In a next edition we will talk about electrical resistances and the loss of voltage associated with them. Every bad contact will cause a part of the battery voltage to be lost, a chain of bad contacts can cause the ignition to stop working or to perform

*It is possible that adjustments have been made to your electrical circuit and you want to repair your wiring loom. The original Volkswagen manuals from Bentley contain all electrical diagrams per model.*

badly, or your headlights will barely shine. Does this sound familiar to you? Then it is time to take care of the electrical circuit of your Volkswagen.

In this article we start with the basics, namely replacing the connections with the original Volkswagen spade connectors. In the next articles we will talk about insulation sleeves, heat shrink sleeves ...

*There are several books available, from 1950 to 1980. These books are a copy of the original VW workshop manuals.*



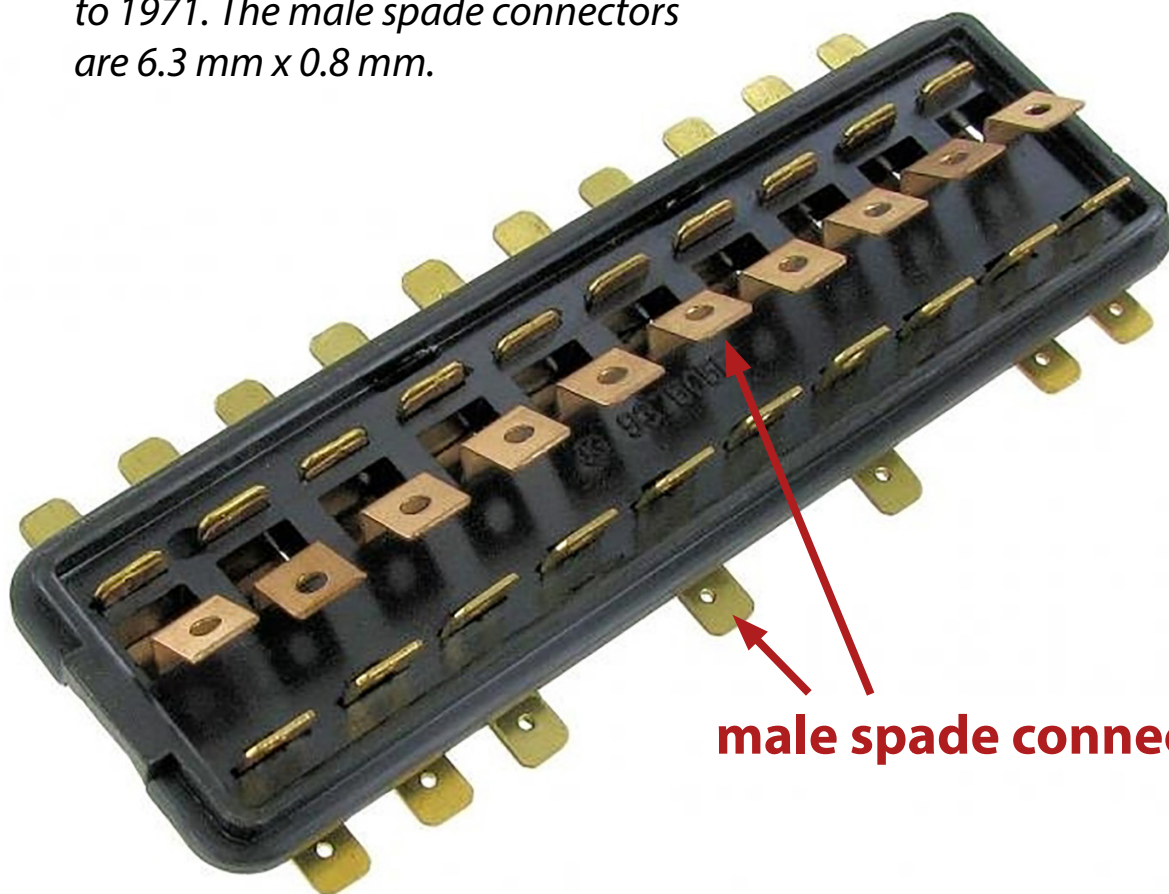


## Determine the spade connector size

There is a diverse range of electrical terminals, it is sometimes difficult to determine exactly what you need for your classic Volkswagen. If you go for original, you also want to use exactly the same spade connectors as those used in the factory back in the day.

*In the picture a fuse box for the VW Beetle or Karmann Ghia from 1966 to 1971. The male spade connectors are 6.3 mm x 0.8 mm.*

Spade connectors come in various sizes and shapes. It is important that they fit on the existing connections of for example the fuse box. When you are looking for spade connectors to repair your wiring loom, it can be very confusing when you look in a catalogue of a specialized electrical shop. This article should help you to make a calculated decision.





# spade connectors

To determine which spade connector you need, you first need to measure the male side. You can find these types of terminals at different places in your VW such as the fuse box, the voltage regulator, the ignition coil, ...

We are going to perform the measurement for the connection of the ignition coil under the engine lid. Measure the width and thickness of the male terminal of the ignition coil with a micrometer:



**0.80 mm**

**width: 6.31 mm**  
**thickness: 0.80 mm**



**6.31 mm**

So you have to look for a female spade connector that fits the male terminal. The size of a spade connector is indicated by the manufacturer on the basis of the male plug where it should slide over, as follows:

**width x thickness in mm**

If we start looking in a catalogue, we will find a suitable size:

**6.3 mm x 0.8 mm**

After you have determined the dimensions of the female spade connector for your application, you need to see how thick the cable is that needs to be connected to the terminal.



*Spade connectors are available in brass (copper-colored) and tin-plated version. The version with barb serves to clip into an insulating sleeve equipped for this purpose.*

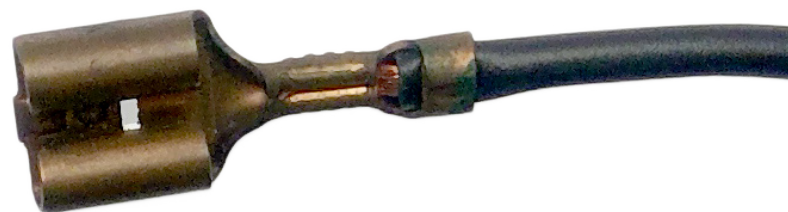
The connection of the cable and the cable insulation are shown in the picture below. The cable must be stripped to a length equal to the smallest clamp, the larger clamp serves to secure the insulation. The sliding plug must therefore be selected according to the cable thickness used.





# spade connectors

On the right we show a cable with spade connector as secured by the factory. Looks neat. The whole thing is not soldered though, which we do recommend for maximum conductivity. We explain how to do this in the next edition.



A spade connector can be professionally finished with these special pliers. All about this in the next edition.

We also show below how not to do it. The plugs are made for a certain wire thickness, you don't want to connect extra cables to one terminal, there are other more elegant solutions for that. In the example below there is a big chance that the cable breaks because the insulation was not secured. This can lead to a breakdown, short circuit or worst case, fire.



If your wiring loom is still 100% original, you can read the cable thickness from the workshop manual. We have marked the connections of the ignition coil with a red circle below.

The connection with the plus of the battery and the green cable of the condenser use a 1.5 mm<sup>2</sup> cable, the other black cable is 1.0 mm<sup>2</sup> thick. You can use a spade connector for the 1.5 mm<sup>2</sup> cable that can receive a cable between 1.0 mm<sup>2</sup> and 2.5 mm<sup>2</sup>. For the 1.0 mm<sup>2</sup> cable, a terminal of

0.5 mm<sup>2</sup> to 1.0 mm<sup>2</sup> is sufficient. We show three cable sizes of spade connectors below.



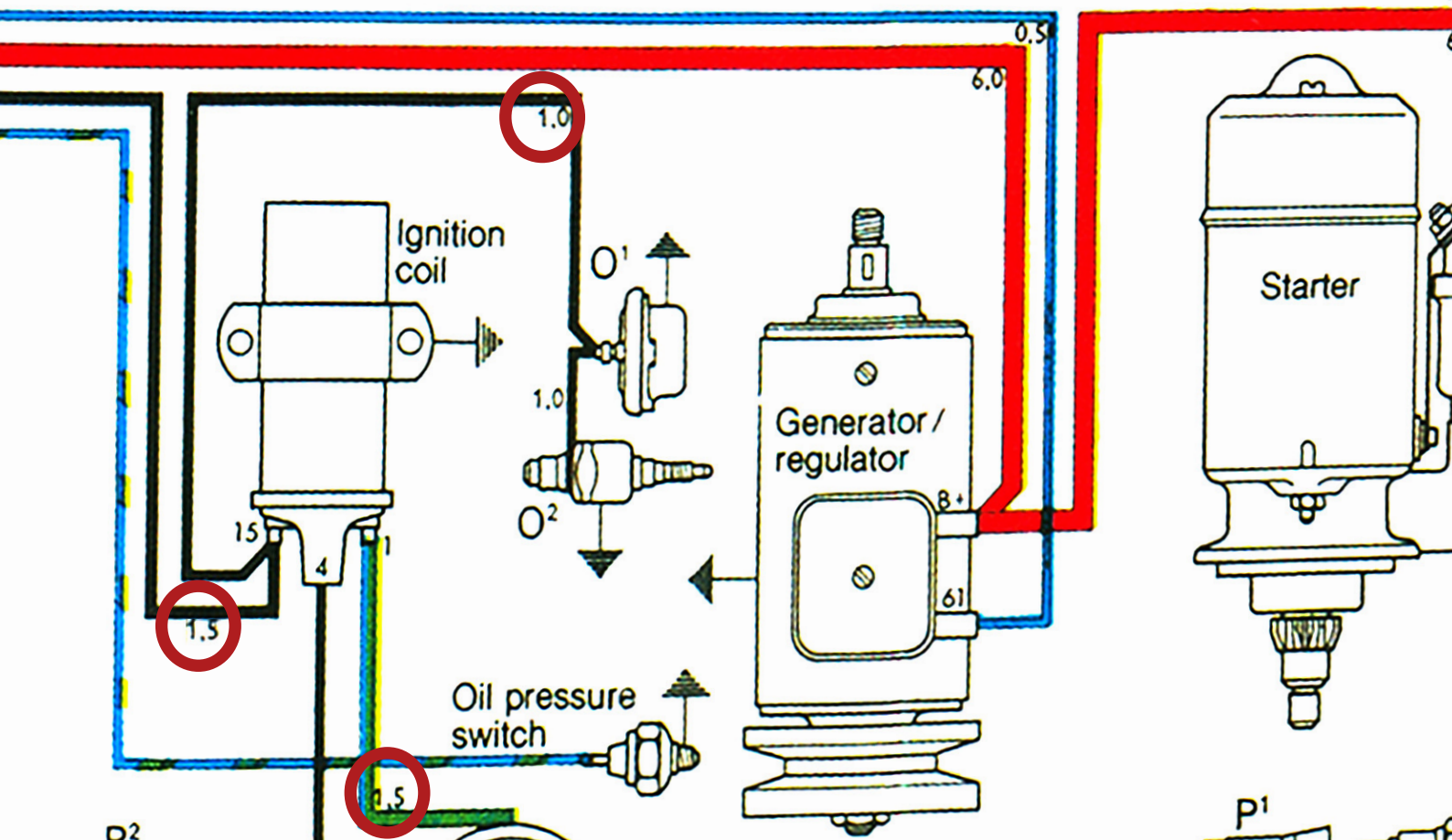
**2.5-6.0mm<sup>2</sup>**



**1.0-2.5mm<sup>2</sup>**



**0.5-1mm<sup>2</sup>**





# spade connectors

If your wiring loom is no longer original, or if you have doubts whether the cables are still correct, you can measure the cables. How do you measure the thickness of a cable?

The thickness of a cable mentioned in the manufacturer's tables is always in mm<sup>2</sup> (square millimeter), this is a surface measurement. You can easily calculate it with the following formula:

$$A = \pi \times r^2$$

**A = surface in mm<sup>2</sup>**

**$\pi = 3,14159$**

**r = radius (= diameter / 2)**

By measuring the diameter of the cable (the conductive copper part, not the insulation!, see picture on the right), you can determine the thickness of the cable. We measure a diameter of 1.00 mm for the black cable connected to the choke. We can now calculate the thickness of the cable, as follows:

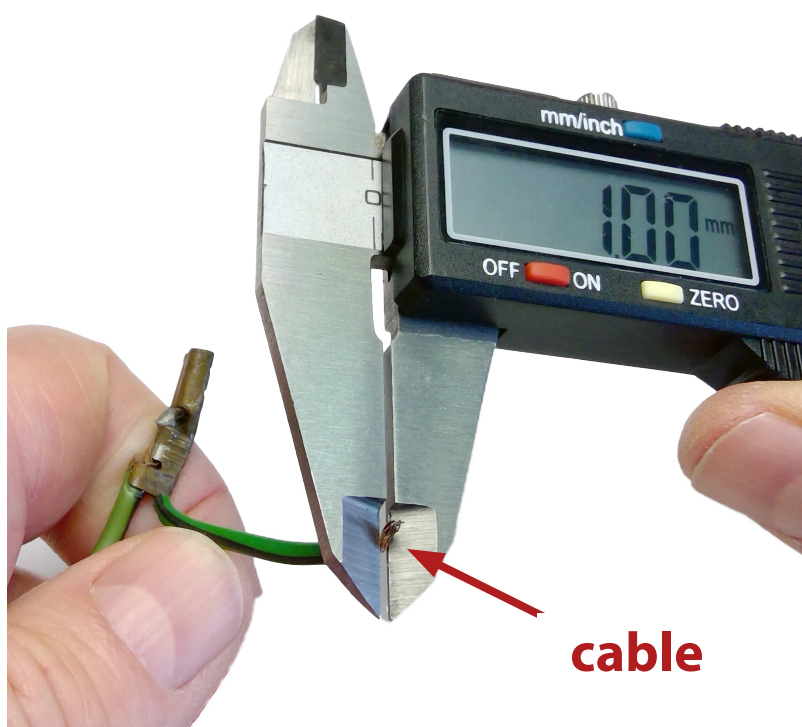
$$r = \text{diameter} / 2 = 1,00 \text{ mm} / 2 \\ r = 0,50 \text{ mm}$$

$$A = 3,14159 \times 0,50 \times 0,50 \\ A = 0,78 \text{ mm}^2$$

According to this calculation we have enough with a spade connector with a cable connection of 0.5 mm<sup>2</sup> to 1.0 mm<sup>2</sup>.

In this way you can determine any spade connector size and search for the right type.

Next time we will show you how to mount and insulate spade connectors.



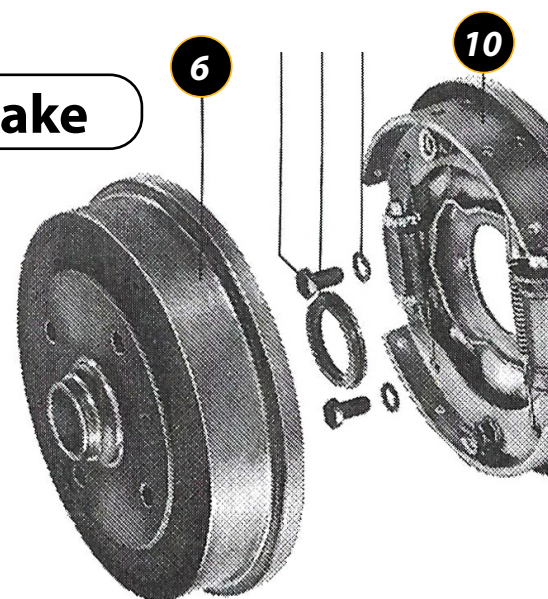
## Introduction

In [edition 18](#) we tuned the wheel play of the front wheels to the feel, in [edition 19](#) we fine-tuned the wheel play by using a measuring clock.

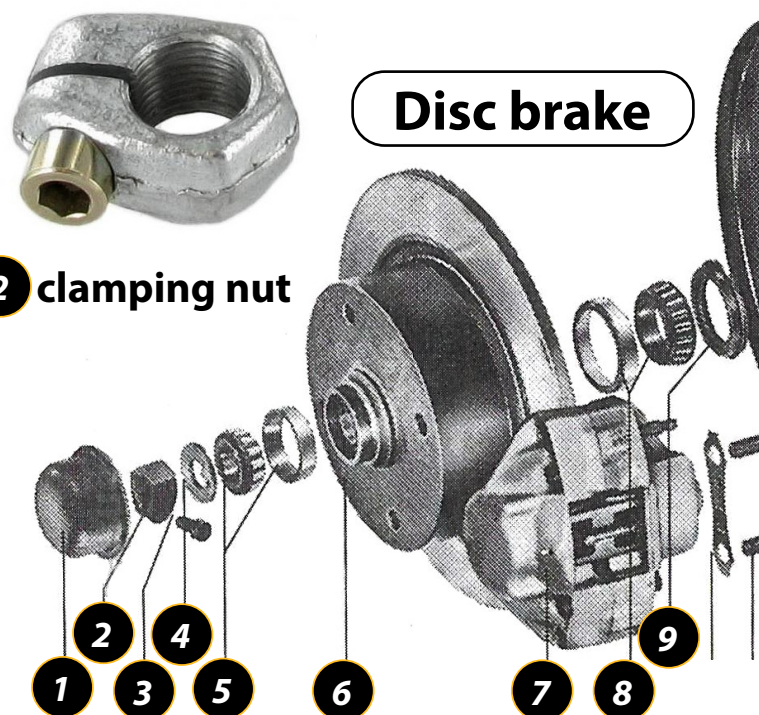
On the right we show a summary drawing of the front wheel bearings for drum brakes and disc brakes. The design can be different for each type of VW, consult your VW workshop manual.

By jacking up the car and turning the wheel, you can estimate whether the wheel bearing is worn. A front wheel bearing must not make any noise while

### Drum brake



### Disc brake



**1** dust cap/grease cap

**2** clamping nut/ball-bearing nut

**3** Allen bolt

**4** thrust ring

**5** outer wheel bearing

**6** brake disc / brake drum

**7** caliper

**8** inner wheel bearing

**9** retaining ring

**10** backing plate

**11** spindle

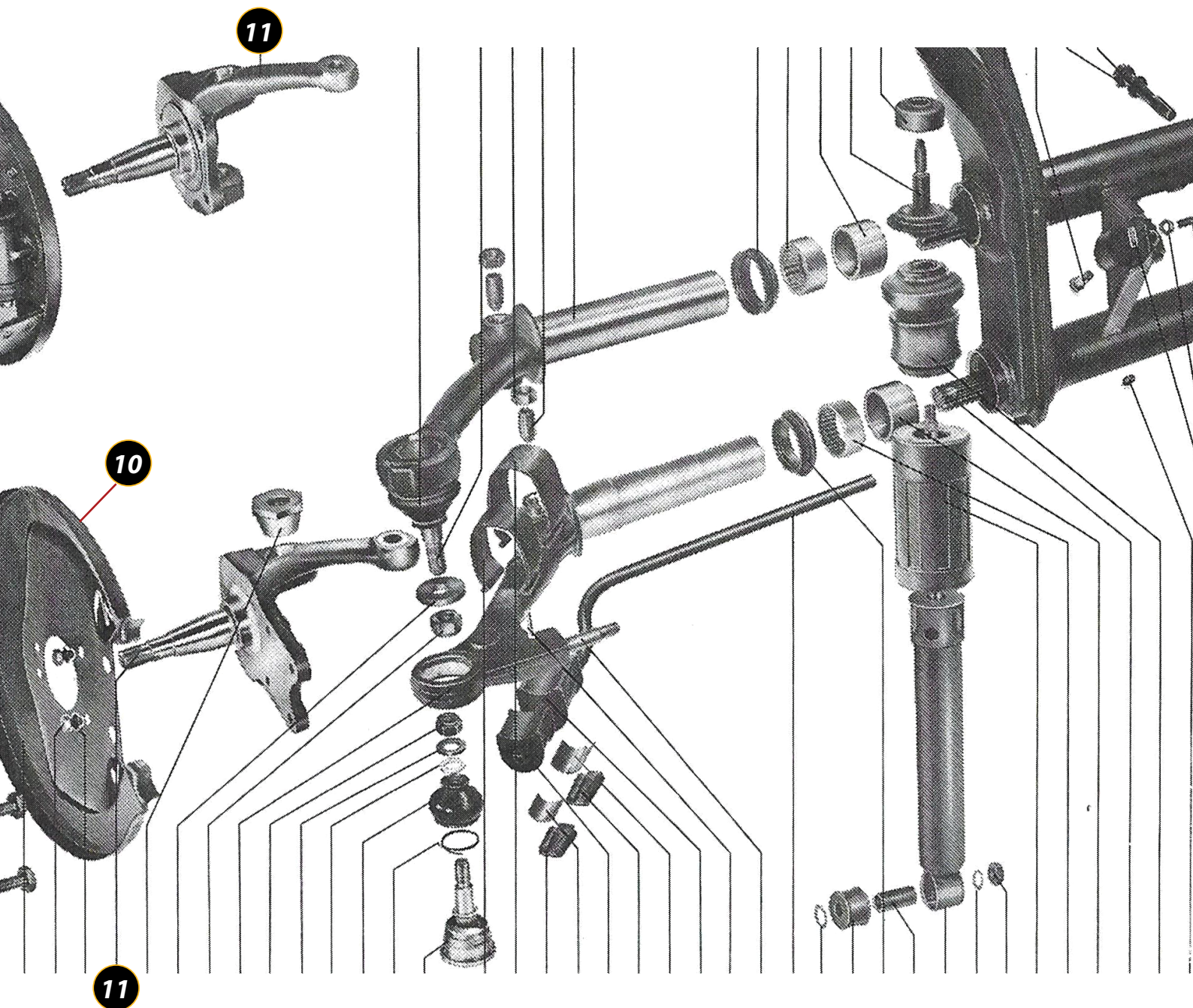




# bearing replacement

turning, except for the friction of the brake shoes (for drum brakes) or the brake pads (for disc brakes) which can make an abrasive noise while turning.

If the wheel bearings are worn or damaged, there is no point in adjusting the wheel play. You will first have to replace the wheel bearings to get a good result.



**Parts list**

The parts you see on the drawing on pages 12 and 13 are shown on our workbench on page 15. This should give you a good idea of which parts you will need to get started. We also use a new backing plate (10) and a fresh pot of wheel bearing grease (12).



- 1** dust cap/grease cap
- 2** clamping nut/ball-bearing nut
- 3** Allen bolt
- 4** thrust ring
- 5** outer wheel bearing
- 6** brake drum
- 8** inner wheel bearing
- 9** retaining ring/bearing seal
- 10** backing plate
- 11** spindle
- 12** bearing grease



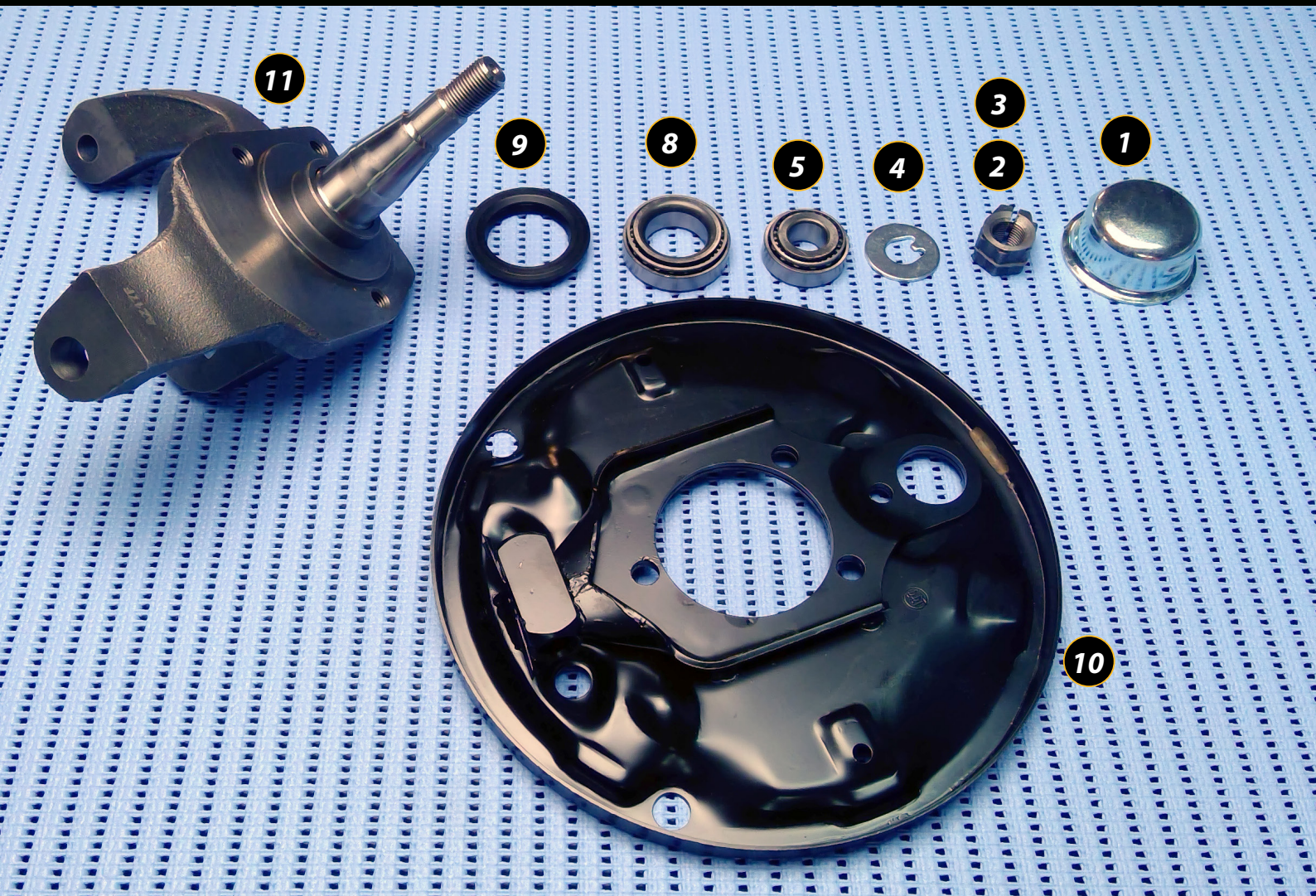
grease cap right

grease cap left





# bearing replacement





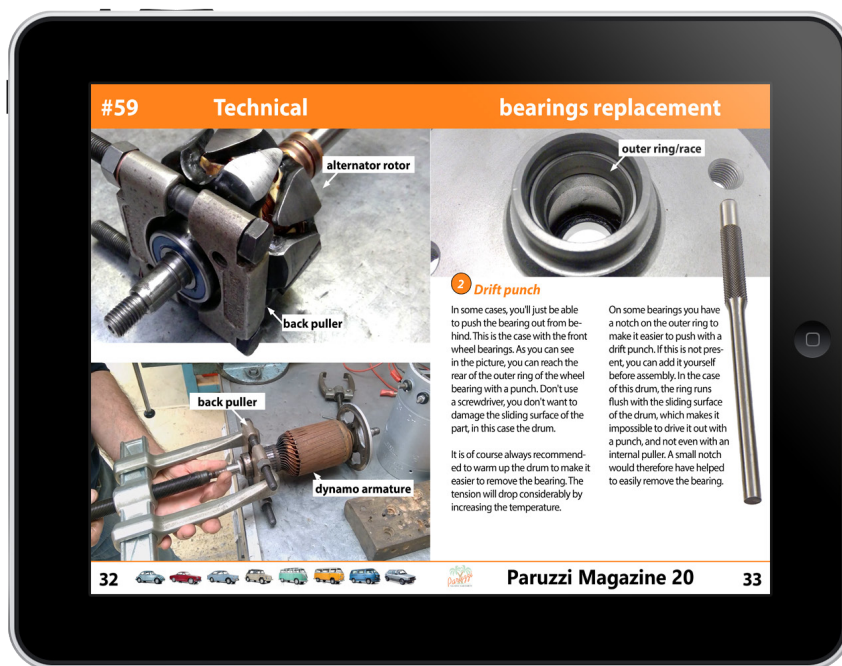
For this article we use a new spindle intended for drum brakes. The procedure for replacing the wheel bearings with disc brakes is similar. There may be some difference between years of construction, but once you have studied this article, you are ready to replace the wheel bearings of different VW models.

The spindle used is of the lowered type, but that doesn't matter much for the replacement of the wheel bearings.

If you are not familiar with working on bearings, first read the article in [edition 20](#) that deals with disassembling and assembling bearings.

In this article we do not discuss how to disassemble the wheel bearings, the article in [edition 20](#) should be more than enough to disassemble the wheel bearings yourself before you start assembling.

Of course you will have to clean all parts thoroughly and check for any wear or damage before assembling the new bearings. If you have any doubts about this, let someone who has more experience advise you.

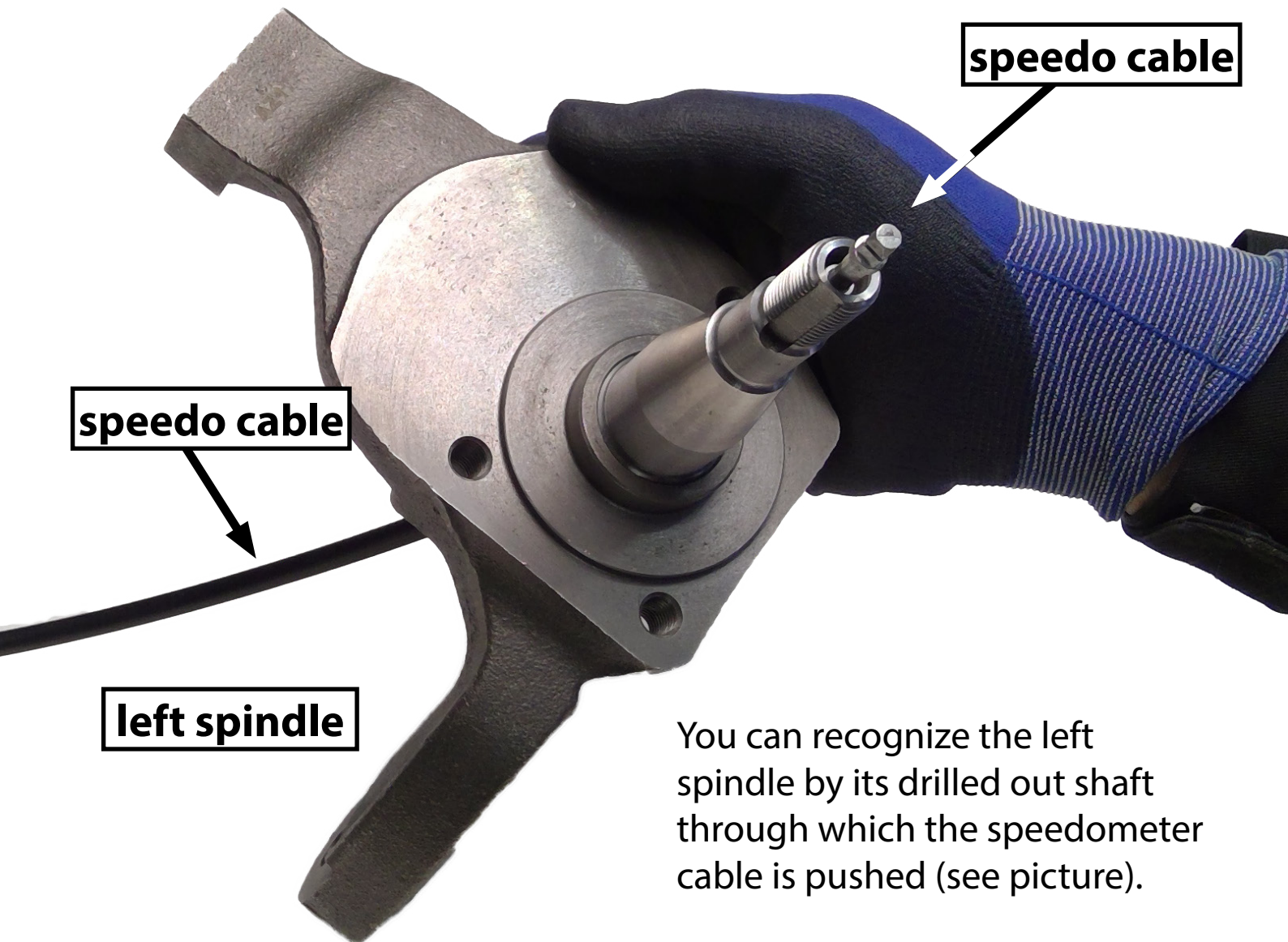
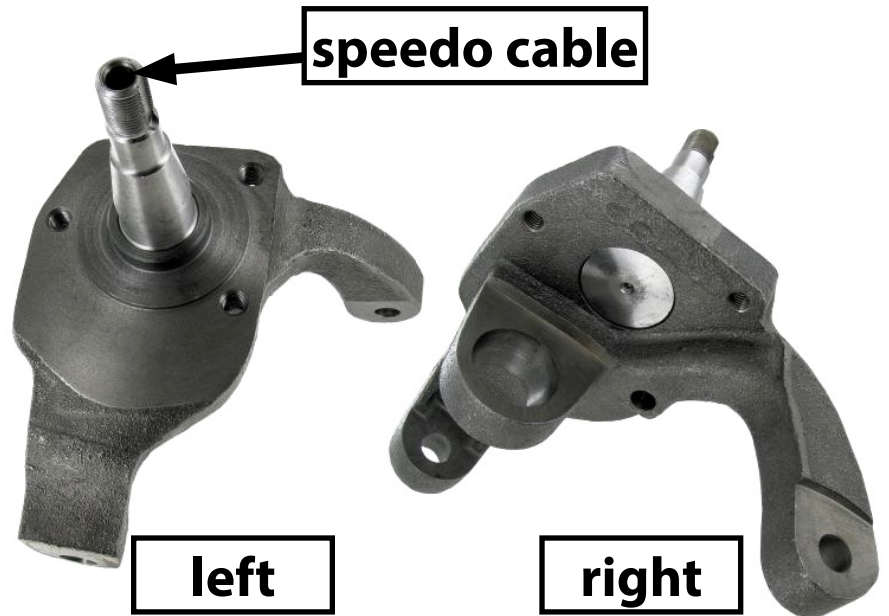




# bearing replacement

## *Left and right*

The technique for mounting the front wheel bearings on the left and right side is the same. We do, however, point out a number of points for attention. The spindles left and right are of course different, they are as if they were a **mirror image** of each other.

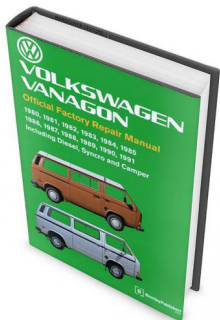


You can recognize the left spindle by its drilled out shaft through which the speedometer cable is pushed (see picture).

An additional difference between the left and right side is the thread to which the clamping nut is attached. The right-hand spindle has a right-hand clamping nut that fits the right-hand thread. We are used to right-hand threading, you turn clockwise to tighten and anticlockwise to loosen.



The left spindle has a left-handed clamping nut that fits on the left-hand thread of the spindle. This takes some getting used to. When adjusting the wheel play of the left wheel, tighten it left, loosen it right! We also refer to [edition 18](#) to know more about these clamping nuts.



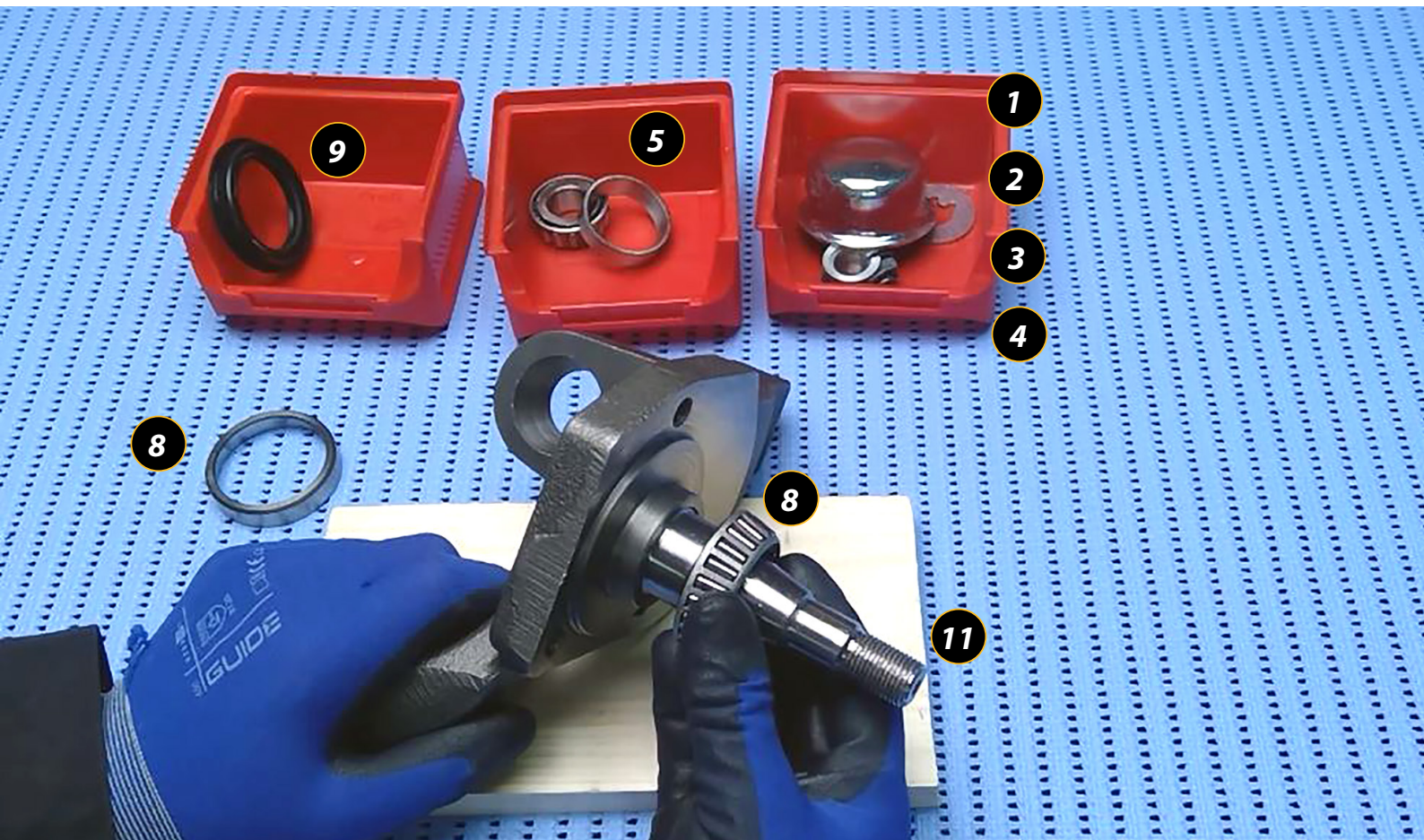


# bearing replacement

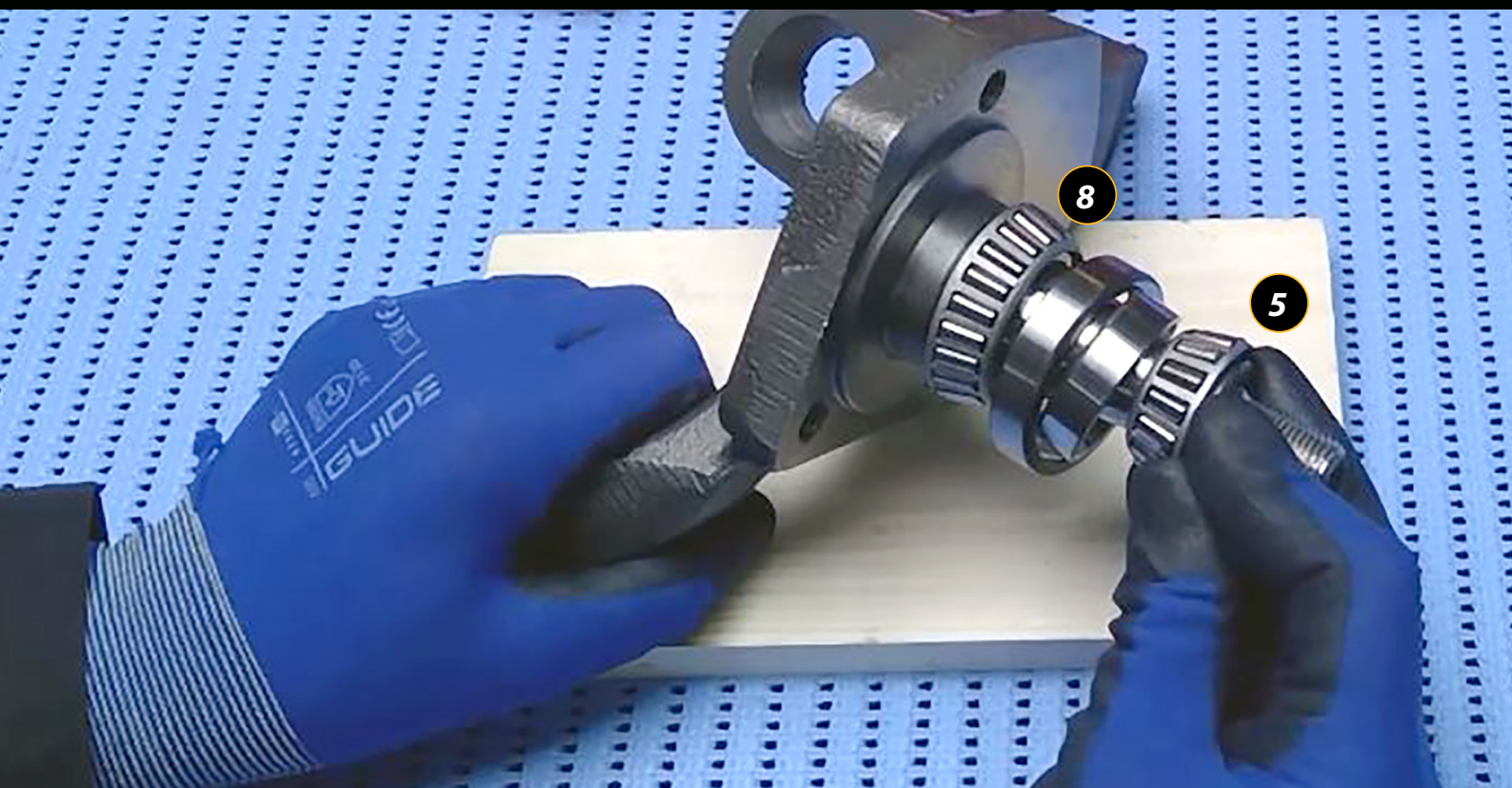
## Preparations

You have ordered all parts for your VW, put them neatly together out of the reach of dirt or dust. Clean everything with brake cleaner if necessary. Now check that the sliding surface of the spindles, over which the wheel bearings slide in sliding fit, is in good condition, it should not show any deep scratches or signs of oxidation. Slide the inner wheel bearing over the spindle (photo below).

- 1** dust cap/grease cap
- 2** clamping nut/ball-bearing nut
- 3** Allen bolt
- 4** thrust ring
- 5** outer wheel bearing
- 8** inner wheel bearing
- 9** retaining ring/bearing seal
- 11** spindle







Do the same with the outer wheel bearing (picture above). Both wheel bearings should slide over the sliding surface of the spindle without much resistance. This test will confirm that you have ordered the correct wheel bearings.

The outer metal ring (race) of the wheel bearing must be pressed into the drum or disc (press fitting, see [edition 20](#)). Measure with a micrometer the opening in the drum or disc, for the inner and outer wheel bearing, and compare this with the size of the respective outer metal ring.

This is a press fit, so the metal ring will be slightly larger than the opening in which it will be pressed, we are talking about tenths of a millimeter. For our drum brake we measure the following values:

**outer wheel bearing 5**

bearing race: 39.88 mm

drum: 39.71 mm

**inner wheel bearing 8**

bearing race: 50.27 mm

drum: 50.18 mm





# bearing replacement

Below we show the measurement of the outer wheel bearing opening in the drum. On the right we show the measurement of the outer wheel bearing race. The difference is 0.17 mm, just enough to press fit the bearing ring in the drum. In the Paruzzi webshop the wheel bearings are shown with year of manufacture. But measurements before mounting are recommended. Possibly your VW has been modified over the years, and the front axle is no longer original, or your chassis has a different year of manufacture than the body.



## Mounting the front wheel bearing

### *Outer wheel bearing*

The front drum or disc is mounted with two tapered (conical) wheel bearings. An outer wheel bearing (this is the smallest of the two) because it is placed on the outside of the drum or brake disc (picture below). The wheel bearing ring must be pushed or pressed into the drum until it pushes against the surface of the drum (see photo).

Whether the ring is fully pushed in will be clearly audible when you knock on it with a bearing drive, the sound will go from sharp to dull.

In [edition 20](#) we show different techniques for mounting a conical bearing. The most professional and safest method to avoid damaging the drum or disc and to push the bearing straight in is to use a bearing drive (see picture below). You can also use the old bearing ring or a socket spanner, or if you have a professional workshop, a hydraulic press.





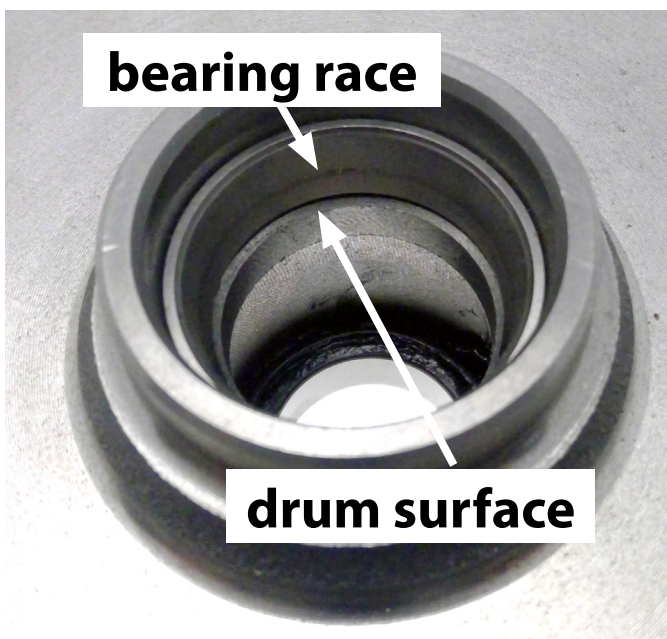
# bearing replacement



Good advice is to heat the drum or disc with a paint stripper (to 60°C) or with a gas burner (to 120°C) as described in [edition 20](#). If you have an infrared thermometer, you can determine the temperature accurately. The bearing race in the freezer for half an hour will help to make the press fit less tight.



With the drum or disc at temperature and the bearing race at -18°C, the insertion of the wheel bearing race will be done without obstruction, it must be done quickly. Make sure that the bearing race is knocked in perpendicularly with the appropriate bearing drive, until the sound changes from sharp to dull. This is the sign that the race is leaning against the drum surface, against the back of the drum or disc. On the left we show the end result. The bearing race of the outer wheel bearing is pressed into the drum and is ready to receive the conical bearing. The conical outer bearing does not have to be inserted yet, first the inner bearing and grease ring have to be mounted.





***Inner wheel bearing***

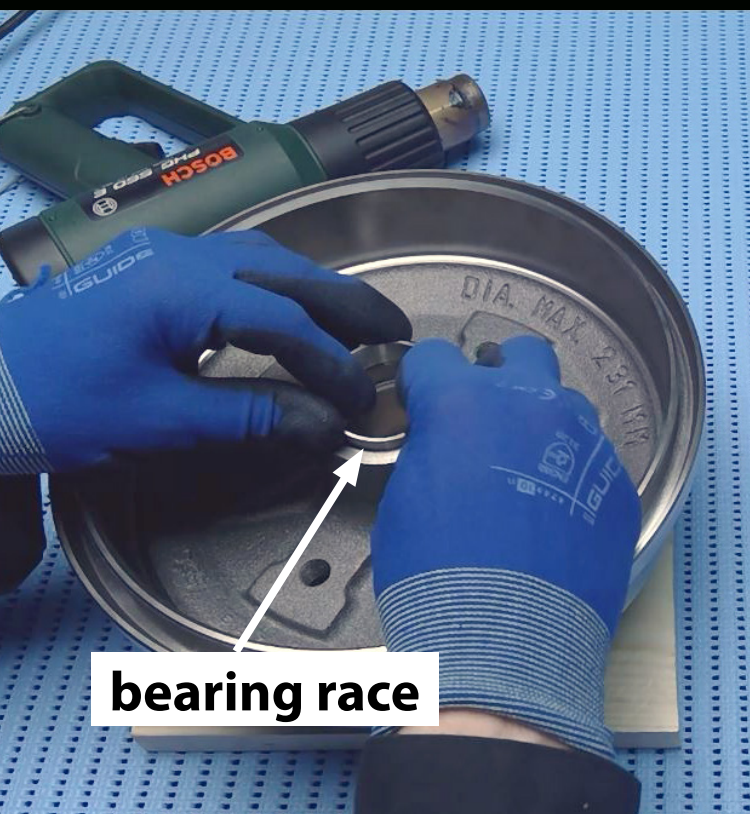
The inner wheel bearing is the larger of the two wheel bearings. Mounting is done in the same way as for the outer wheel bearing. The bearing ring is mounted using one of the techniques described in [edition 20](#).

The bearing race cannot be pushed any further than against the surface provided in the drum or disc (see photo).





# bearing replacement

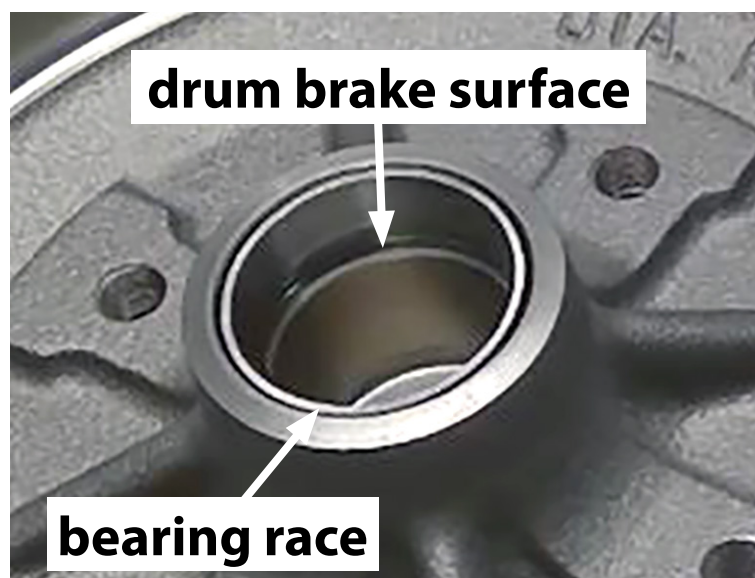


Also for the inner bearing it is wise to heat the drum or disc well up to about 100 °C with a paint stripper, and to shrink the metal bearing ring in the freezer, just like you did for the outer bearing.

Put the bearing race in the bearing surface of the drum or disc, make sure the bearing race goes straight in. If the bearing race does not go in perfectly straight, it will get stuck at a certain point and possibly damage the bearing surface of the drum.



If the drum is warm and the bearing race is cooled, the bearing race will to a large extent fall in by itself (pictures above and below). Now the bearing race has to be guided further to the surface of the drum.







With a bearing driver you can knock the bearing race further in, keep the bearing driver at an angle of  $90^\circ$  on the bearing race in such a way that it does not skew. You will hear the knocking sound when the bearing race pushes against the contact surface, the hammer sound will change from sharp to dull. On the right we show the mounted bearing race of the inner wheel bearing.





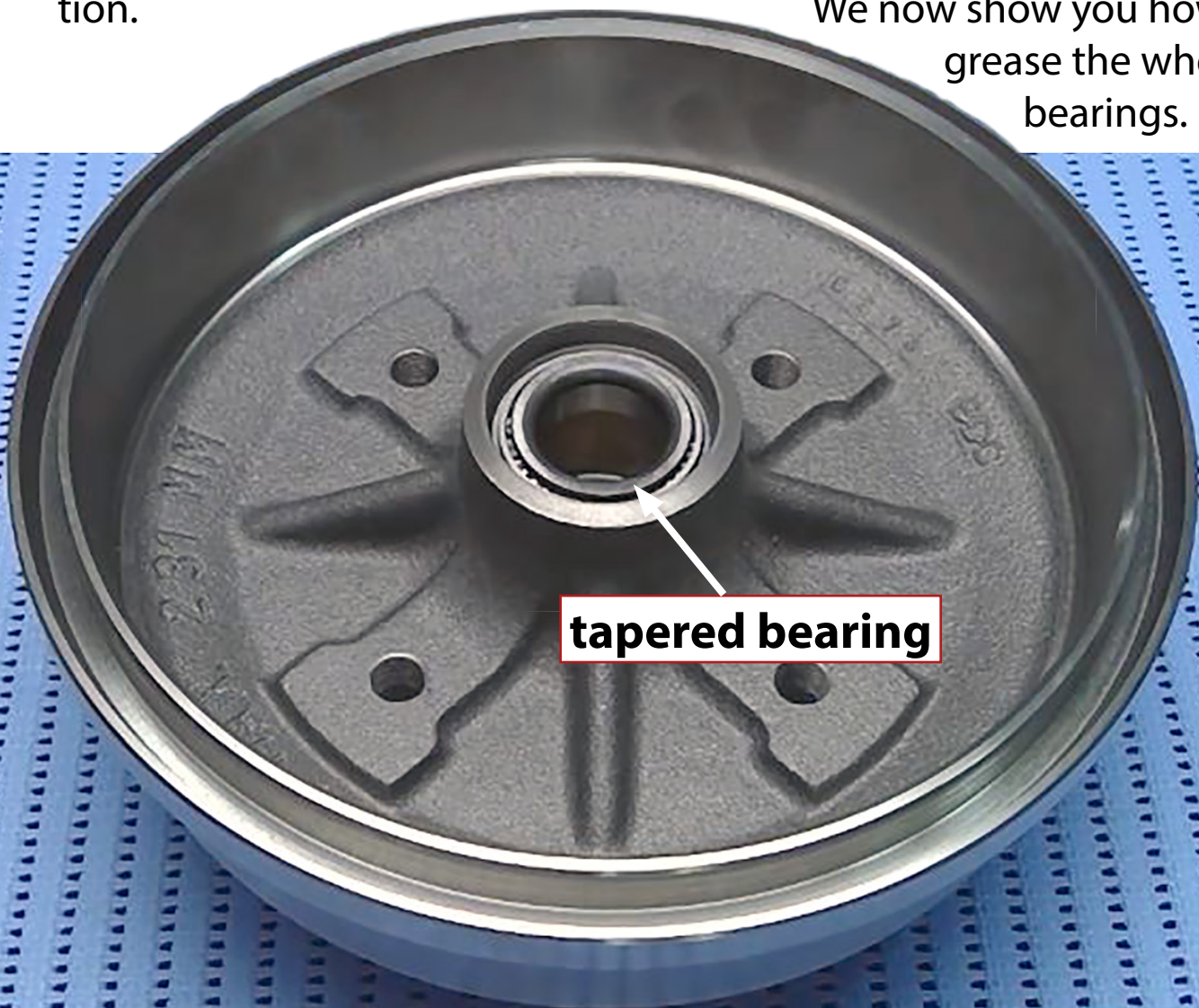
# bearing replacement

Below we show the drum with the tapered bearing resting on the bearing race. You should be able to rotate the bearing and get an idea how the whole works. The shaft of the spindle will soon slide into this bearing, the wheel bearing ensures that the drum, and therefore the wheel, can rotate without friction.



It goes without saying that the tapered wheel bearing must be provided with grease. This is a critical phase in the assembly of the wheel bearings. A poorly greased bearing will overheat, the surfaces of the tapered bearings will wear out prematurely resulting in jamming and breaking of the wheel bearing.

We now show you how to grease the wheel bearings.



tapered bearing

### Greasing

With the outer bearing race now mounted in the drum or disc, it's time to grease the tapered wheel bearings. It is extremely important that all parts of the bearing are well greased. Especially the inside of the bearing is sometimes not filled with enough grease.

You can use a grease press as we show on the pictures. This is a very handy tool when you have to deal with greasing bearings on a daily basis.

### grease press



© www.ToolSource.com

A disadvantage is that you have to fill the pot with a large amount of grease for a certain application. If you want to use a different grease, it is best to have a second grease press.





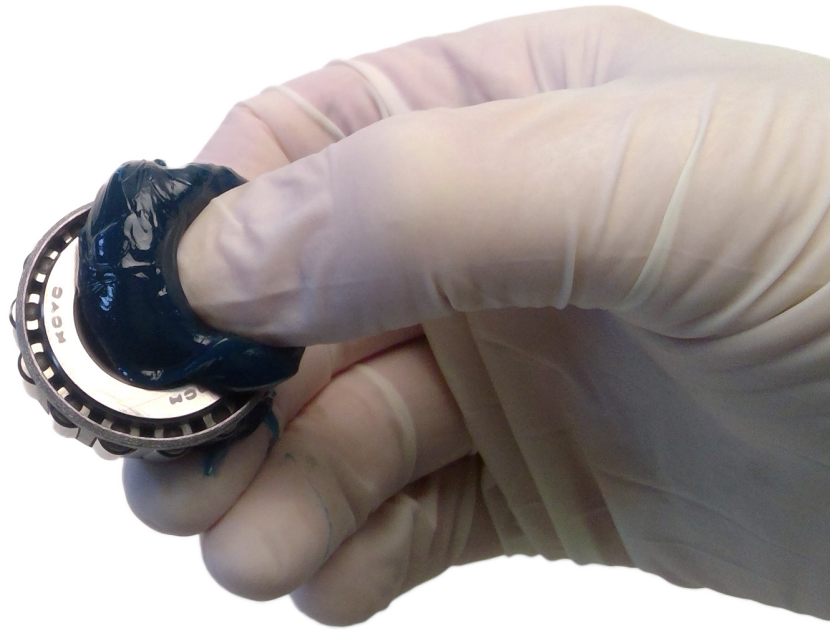
# bearing replacement

You can also grease the bearings without tools. Patience is required, you can see this as relaxation therapy.

**If necessary, first clean the wheel bearings with brake cleaner.**

Use silicone gloves to protect your hands from the grease. With a firm portion of grease on your thumb, push against the bearing so that the grease touches between the conical bearings until it comes out on the other side. Turn the bearing over and repeat. Repeat this until the inside of the bearing is saturated with grease. There comes a moment when the wheel bearing is completely filled with grease, now provide the outside of the bearing with enough grease and the bearing is ready for mounting.

You understand now that this takes too much time for a professional, for me this is a moment of relaxation.



We use universal lithium grease for this application, this type of grease is part of the standard equipment of every workshop. This grease is suitable for lubricating the front axle as well as the wheel bearings, plus many other tasks such as protecting nuts and bolts from jamming.

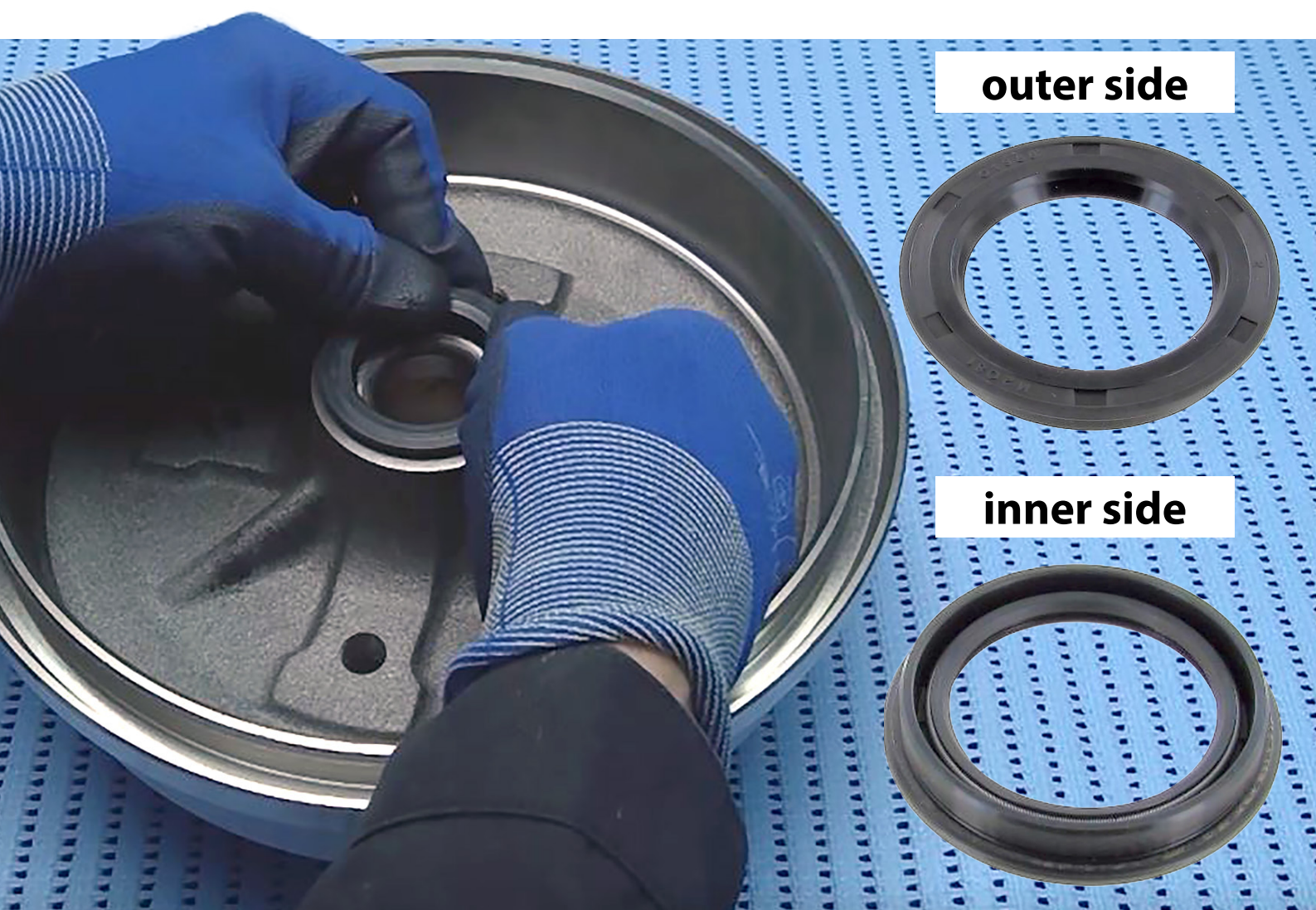


**Bearing seal**

The grease of the inner wheel bearing is held in the wheel bearing by a grease seal. Before mounting the grease seal, make sure there is enough grease on the outside of the wheel bearing. Place the grease seal with its inner side against the drum or disc, make sure that the seal is flush all around. **Do not use oil or grease to install the grease seal!**

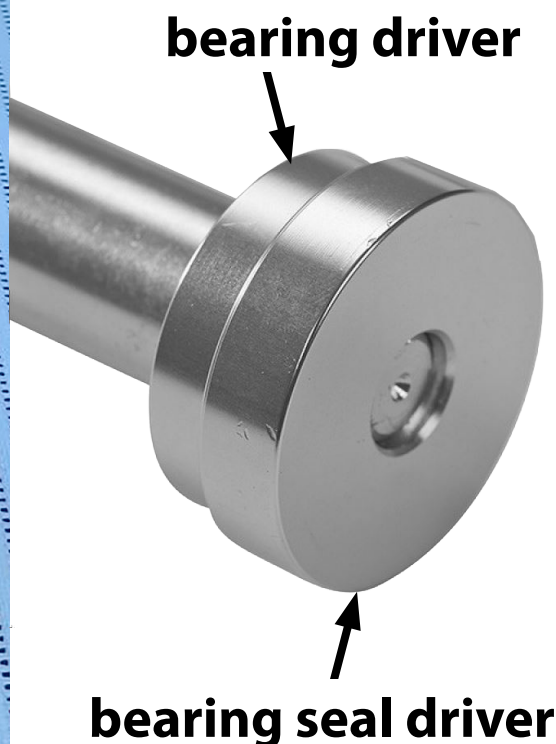
The inside of the grease seal can be recognised by the spring that keeps the seal tensioned. The pictures below should help you to determine the correct mounting.

Once the grease seal is in place, you can push it further with a bearing seal driver (refer to the picture on page 31).





# bearing replacement



© www.Datona.be

Bearing drives are supplied with adapters of different sizes. These can be used to mount both a bearing and a grease seal. In the picture above on the right we show such an adapter. For the grease seal we use the widest side, as you can see in the picture above.

You can also mount a grease seal with a suitable socket (picture right). We prefer a bearing driver, the adapter is made of aluminum and therefore softer than a cap.

We have now finished assembling the bearings, the drum or disc can be slid onto the spindle.

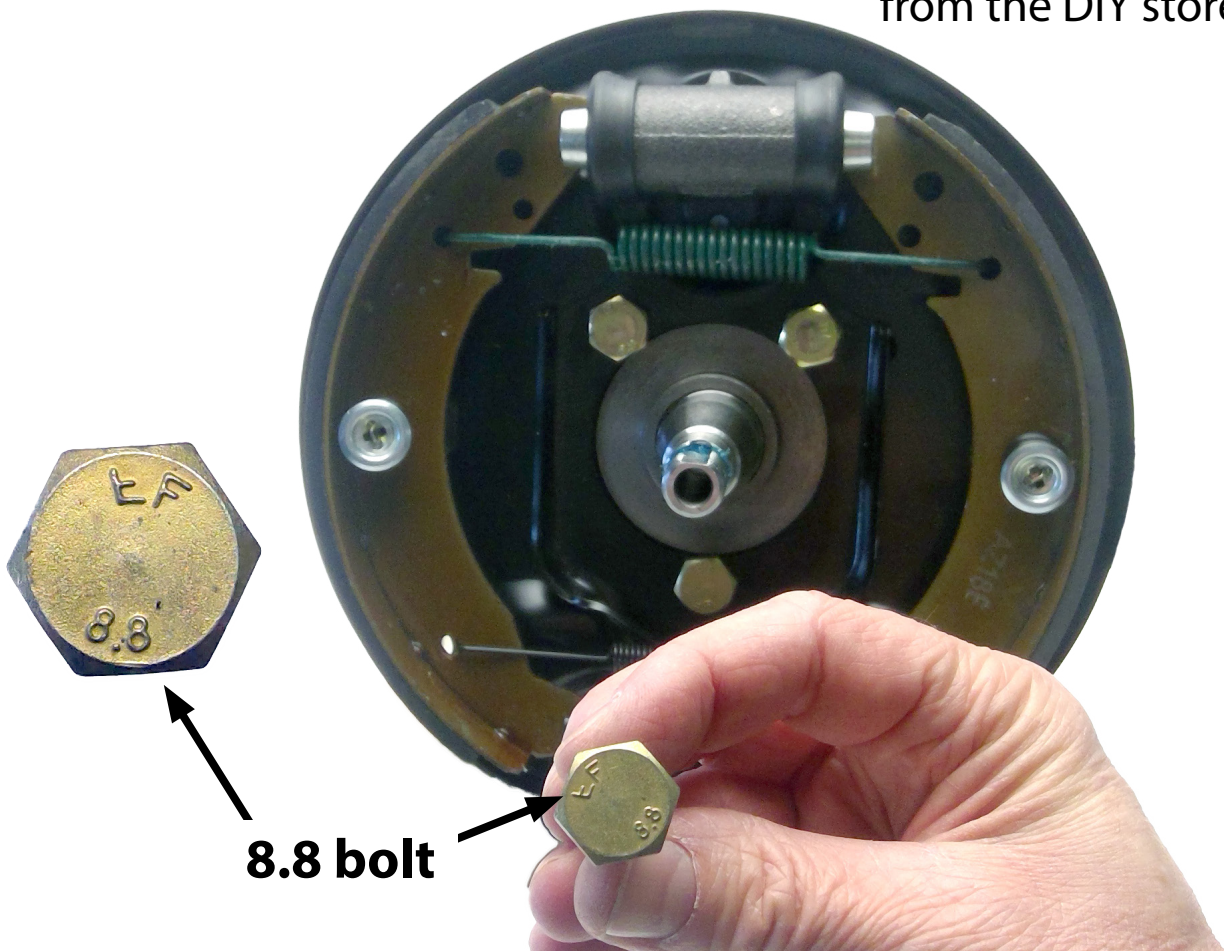


## Mount drum or disc on spindle

### *Backing plate*

We have used new parts for this article, including a new backing plate. The backing plate may remain in place with your VW if it is not too rusty or damaged. What you should certainly pay attention to, while you are at it, is whether the backing plate is properly fastened with the correct bolts. Believe me, there are often wrong bolts in it.

Large forces are exerted on the backing plate, the brake parts are attached to it. The large forces must be absorbed with bolts that are strong enough, 8.8 bolts are used for this application. These numbers indicate the strength of the bolt, the higher the number the stronger the bolt. So it is really not an option to replace these bolts with bolts from the DIY store!





# bearing replacement

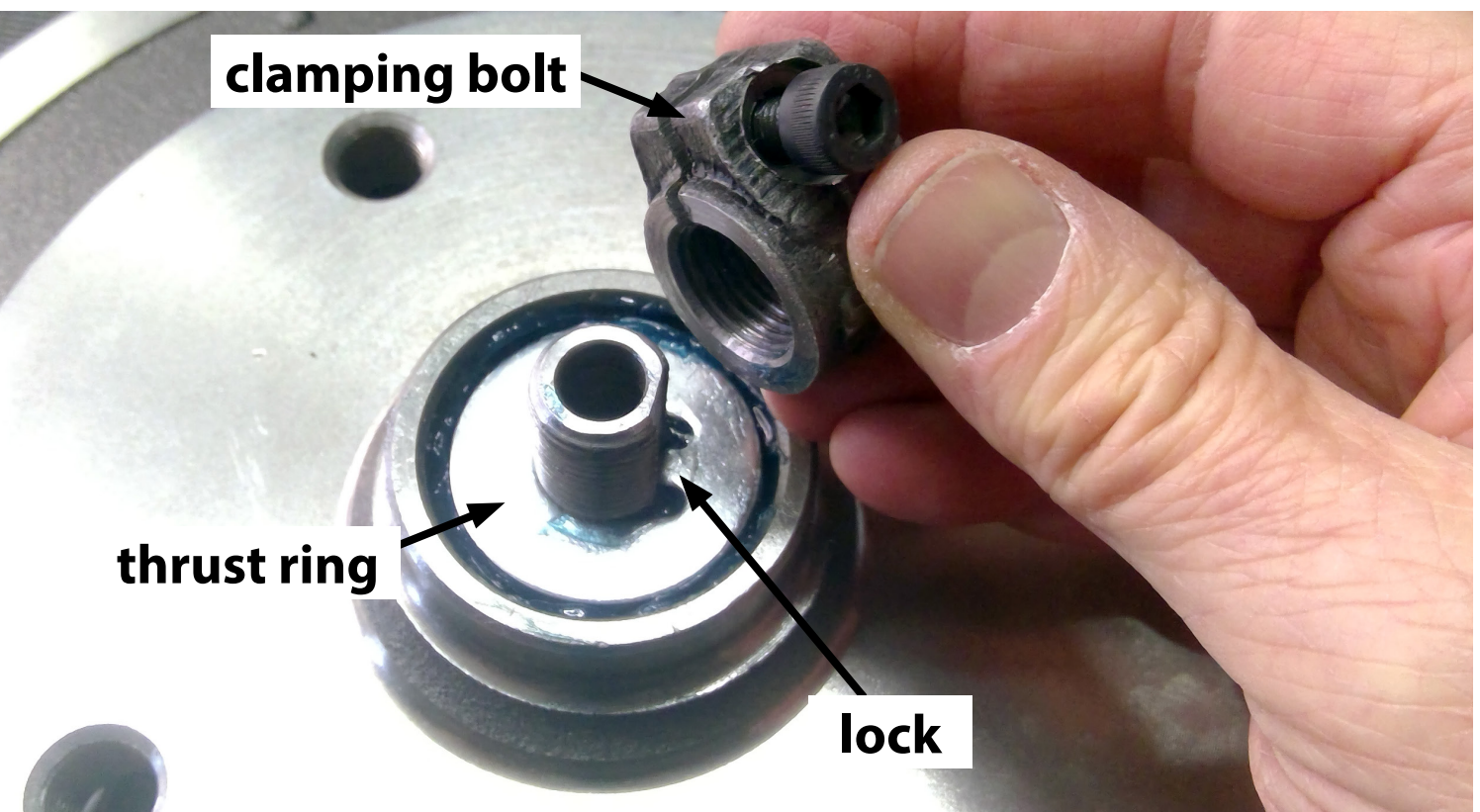
## ***Thrust ring and clamping bolt***

The drum (or disc) can now be slid over the axis of the spindle. The inner and outer bearing has a sliding adjustment on the shaft of the spindle, the drum should slide over the spindle without too much resistance.

Apply a little grease to the tapered bearing (picture below). The grease of the outer wheel bearing is held in place by a thrust ring.

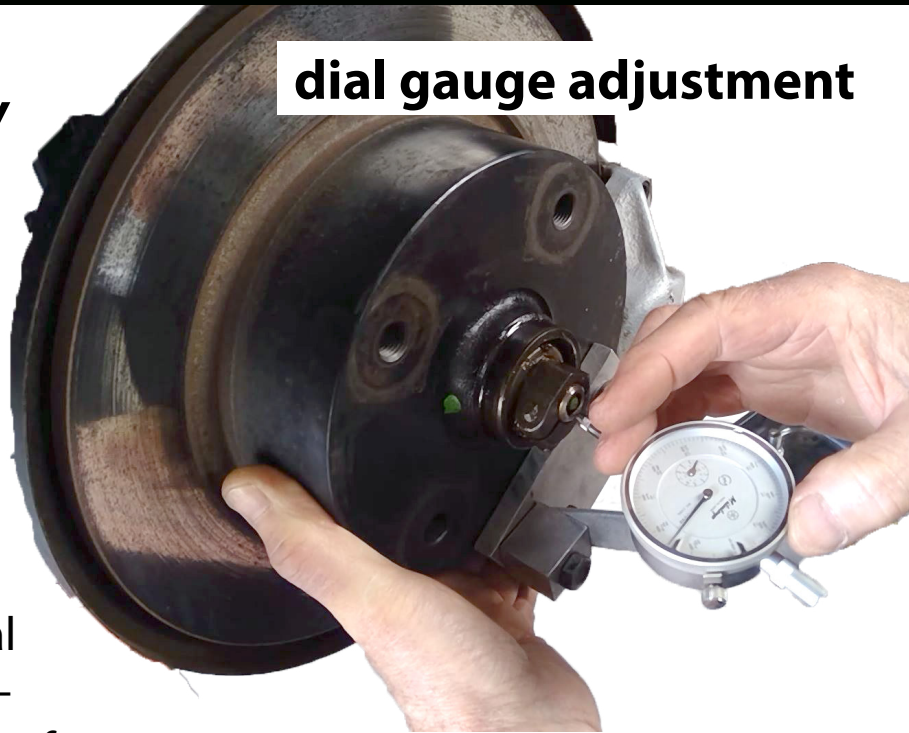
The shaft of the spindle has a flat side that fits in the locking of the thrust ring. The drum or disc is fixed with a clamping nut (photo below).

The number of parts or the type of parts to secure the drum or disc may vary depending on the type and model of your Volkswagen. Consult the Paruzzi web-shop and your workshop manual for more details.



***Adjusting the wheel play***

Now that the drum (or disc) is attached to the spindle, we have to adjust the wheel play. This subject was discussed extensively in [edition 18](#) and [edition 19](#) of this technical series. In [edition 18](#) we did it manually, in [edition 19](#) we did it with a dial gauge. Consult these two editions to adjust the wheel play of your Volkswagen.

**dial gauge adjustment****manual adjustment**



# bearing replacement

## **Grease cap**

We're almost there. Maybe you've already mounted the wheel to feel the wheel play better. If not, you may attach the wheel now.

The hub cap or grease cap serves to protect the outer bearing from getting wet and dirty. You may lubricate the inside of the grease cap with a little grease against corrosion, it should not be much. Use grease that stays in place, very sticky grease.

You can recognize the left grease cap by its square hole in the middle. This hole serves to drive the speedometer cable. The hole should be nicely square, as should the speedometer cable. If it is not, you will need to replace both the cable and the grease cap. The right-hand grease cap has no hole on most classic VW's.



**grease cap right**



**speedo hole**



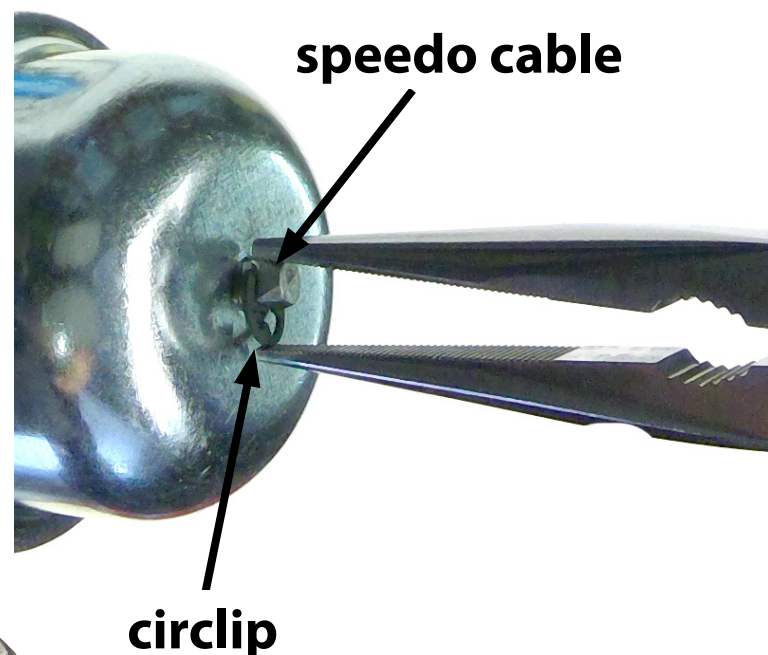
**grease cap left**

### Speedo cable

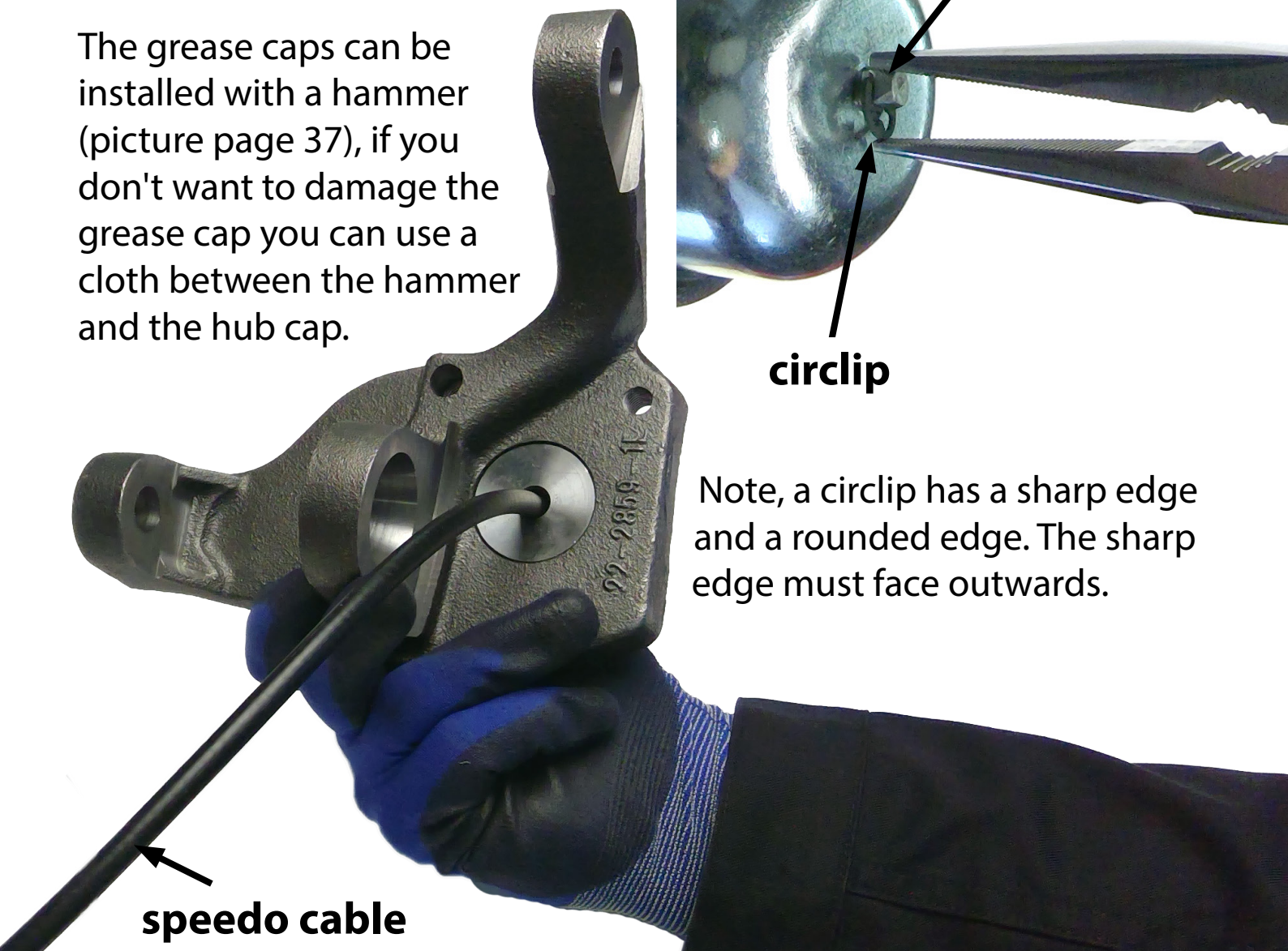
On [page 17](#) we already showed the outer side of the left spindle with the speedometer cable running through it. Below we now also show the inner side. So you have to push the speedo cable through the spindle before you attach the grease cap.

The grease caps can be installed with a hammer (picture page 37), if you don't want to damage the grease cap you can use a cloth between the hammer and the hub cap.

On the left grease cap you still need to secure the speedometer cable with a circlip, use a fine pair of pliers (picture below).



Note, a circlip has a sharp edge and a rounded edge. The sharp edge must face outwards.





# bearing replacement

## Conclusion

A job that turns out to be beyond the VW enthusiast reach will become feasible with this article, we hope. In the next editions we will replace the rear wheel bearings and repair and adjust the brakes.

All articles are collected in our website through in the special magazine page. We have put all editions side by side, as well as all articles arranged by topic. You can also find additional technical tips in the blog section of this page.



## Introduction

Changing the oil of a type 1 engine is a job that everyone has done. Volkswagen recommends loosening the sump plate and cleaning the oil sieve every time you change the oil. The contents of the oil sieve will tell you a lot about the condition of your engine and about maintenance history. The drain plug or drain bolt should only be used to drain the oil without spillage.

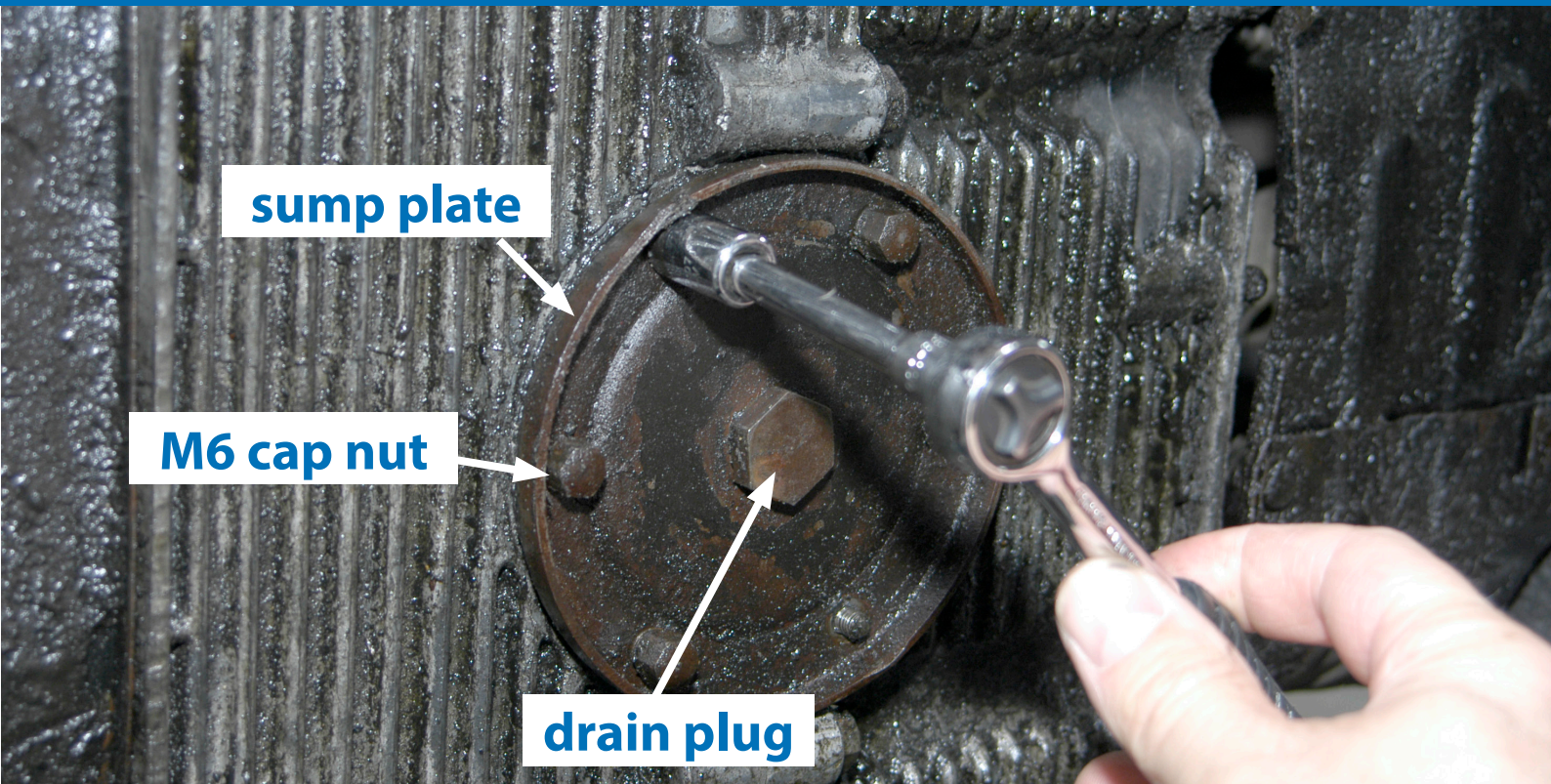
An easy job at first sight. But how many VW enthusiasts are surprised that the engine leaks after an oil change? Read all about the type 1 crankcase cover in [edition 20](#), what to look out for, how to attach it and with which tools.

**short handle =  
low force**





# sump plate stud length

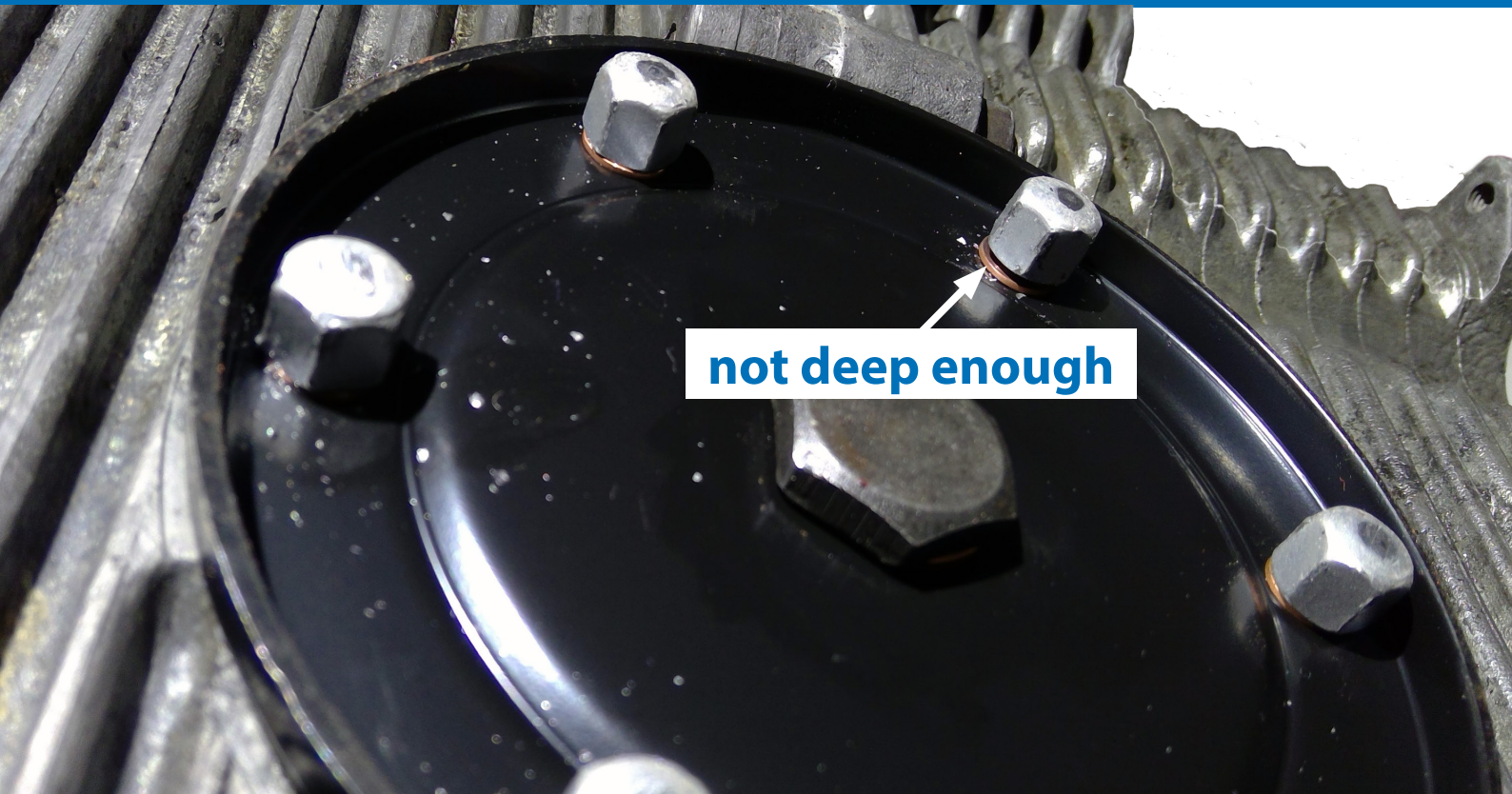


The use of a small torque wrench is recommended, the M6 nuts must be tightened with 7 Nm, this is really not much. If you don't use a torque wrench, use a socket wrench with a short handle (picture page 38).

In [edition 20](#) we addressed a common problem regarding the sump plate. Whatever you do, the oil leaks along the sump plate are unstoppable. Tightening the sump plate nuts doesn't help, changing the gaskets doesn't help. Why is that?

The six small M6 nuts have a closed head to prevent engine oil from leaking along the studs in the crankcase (not all VW engines have these nuts). So you have to be careful that the stud doesn't stick out too much. If this is the case, the M6 cap nut will not be able to tighten completely, because the stud will get stuck against the inside of the head of the M6 cap nut. The underside of your engine will be as shown in the picture above, it could be a rejection during the technical inspection.





If you have just purchased a classic Volkswagen and you are planning to carry out initial maintenance, check that the studs are inserted at the correct depth.

If they are too deep, you may not have enough thread to tighten the M6 nuts properly. If they are not deep enough, the head of the studs will get stuck against the M6 cap nut. The result is that the closure of the sump plate against the crankcase is not optimal, resulting in oil leaks.

If you mount a new sump plate, with new gaskets, it is recommended to measure the depth of the studs.

There is quite a difference in thickness of materials between different manufacturers. Sump plates have different thicknesses, gaskets exist in different qualities and materials, but also the sump plate nuts can have a different depth than the original. Checking the position of the studs will give you certainty, and oil leaks around the sump plate will disappear.



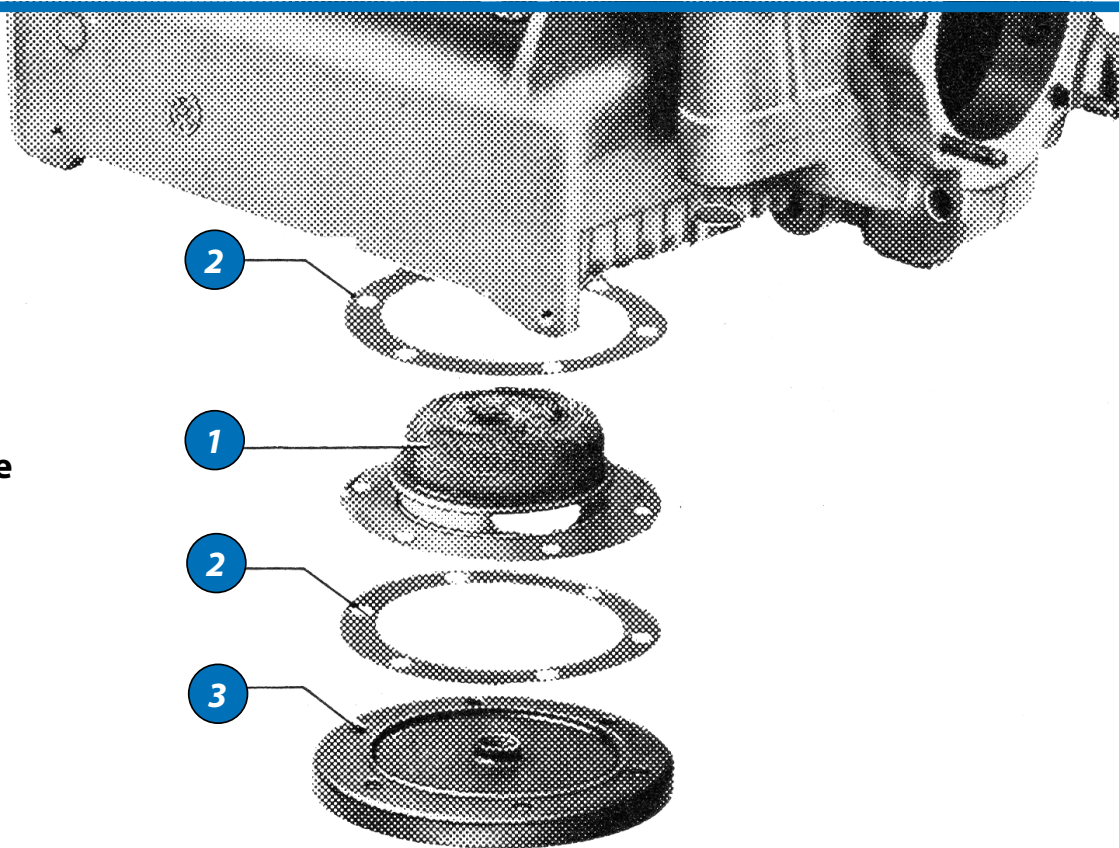
# sump plate stud length

## Determine maximum stud depth

When you have bought a classic VW, it will soon turn out if the studs of the sump plate have been mounted at the correct depth. Make sure you do this before fitting the sump plate. If the studs are not installed correctly, you will have to remove the sump plate in no time and replace all gaskets again. Collect all parts in the correct order as shown in the drawing below.

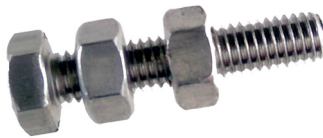
Use the paper gaskets, the oil screen and the sump plate that you will be using after the oil change. As mentioned before, there are differences in material thickness depending on the manufacturer. On the next page we show all the parts we will use for our type 1 AB 1300 engine.

- 1** oil screen/sieve
- 2** paper gasket
- 3** sump plate



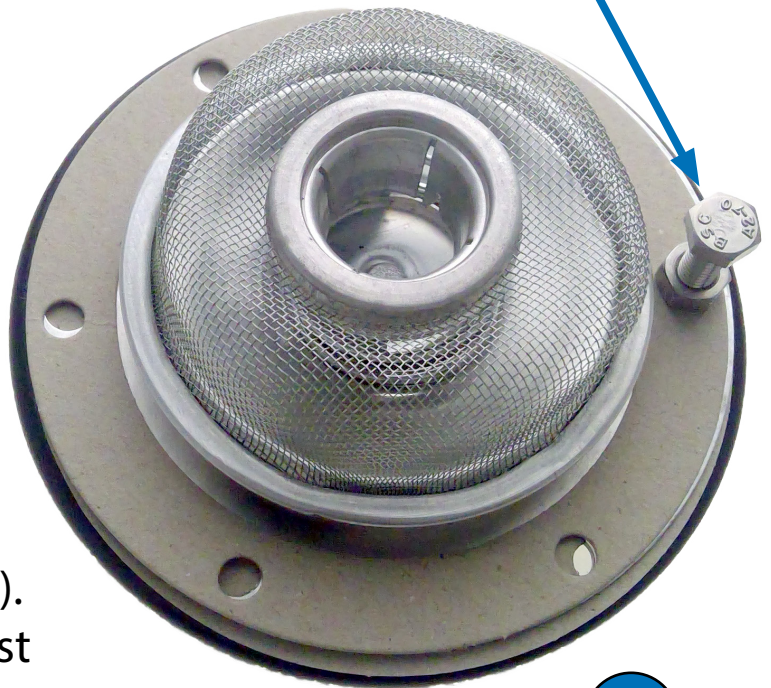


*If you use two nuts technique, it will be easier to fix the setting.*



2

**M6 bolt with nut**



Place the two paper gaskets and the oil screen on the sump plate (photo 1 and 3) and slide an M6 bolt with nut (2) through one of the sump plate holes (photo 3). Make sure that the bolt protrudes at least 1 cm at the bottom of the sump plate (more than the thickness of the cap nut). The nut will later be used to adjust the stud depth.



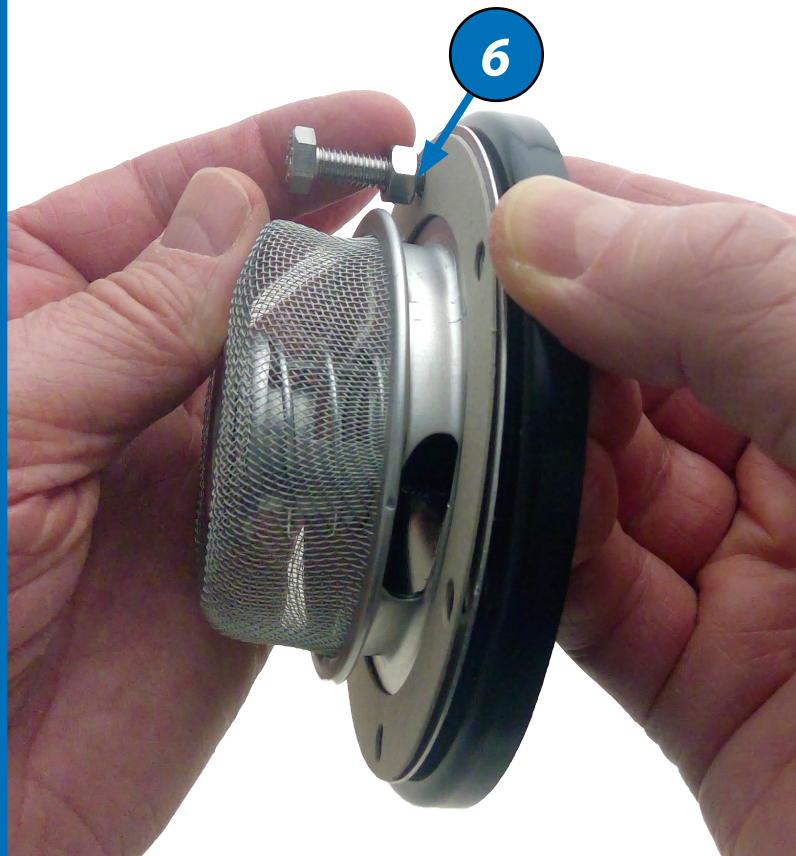


# sump plate stud length

Use a copper gasket ring (preferably the same type you will use later), slide it over the M6 bolt (picture 4).

Take a sump plate cap nut and screw it all the way in until it locks onto the M6 bolt (see picture 5).

Now hand tighten the M6 nut at the back (picture 6).



7



7 Nm

To obtain an exact measurement, it is best to tighten the cap nut to 7 Nm with a torque wrench (or with a tool as on page 38, or as shown in [edition 20](#)), while holding the nut at the back (picture 7). Tightening the cap nut will crush the copper ring and the paper gaskets (note, a copper ring can only be used once).

Now loosen the sump plate nut completely and remove the M6 bolt at the back of the sump plate (picture 8).

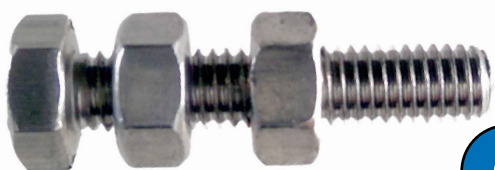
8



one-and-a-half turn

*Use some Loctite to tighten the nut, or use a second nut, you have to install the second nut on the bolt beforehand.*

To give the necessary play to the sump plate nut, you can turn the nut on the M6 bolt one and a half turns away from the bolt head (picture 8). Make sure that this setting does not move anymore. Use a little Loctite, you can also use a second nut (but it had to be on it beforehand, pic 9).



9





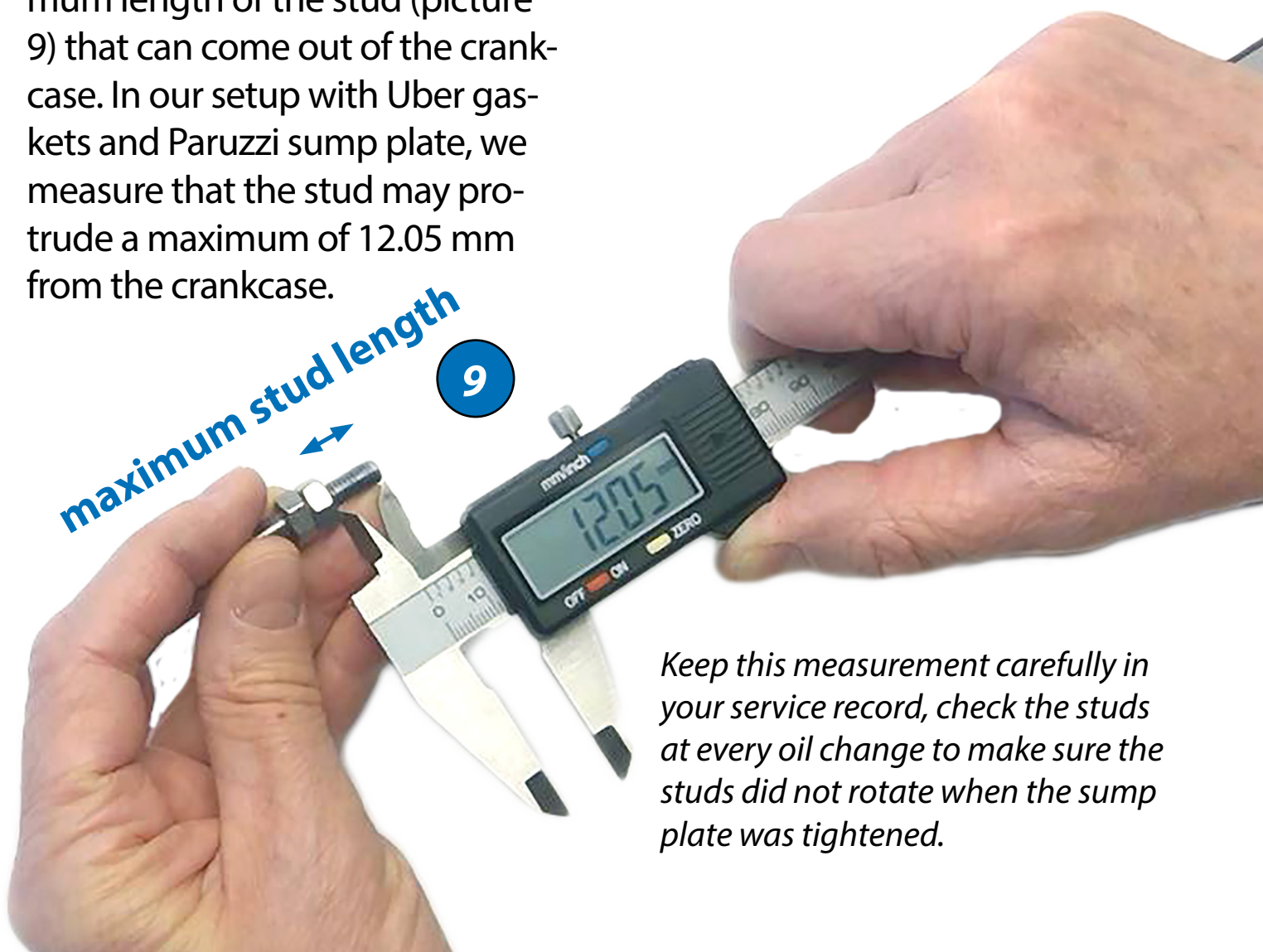
# sump plate stud length

With this technique you have determined the maximum length of the stud, where the inside of the closed head against the sump plate nut just doesn't touch the stud. This measurement is of course unique to your engine for the parts used in the measurement.

You can now measure the maximum length of the stud (picture 9) that can come out of the crankcase. In our setup with Uber gaskets and Paruzzi sump plate, we measure that the stud may protrude a maximum of 12.05 mm from the crankcase.

The length may vary depending on the parts used.

If you respect this maximum length, the sump plate cap nut will not jam against the stud. We now show you how to use this measurement in practice.



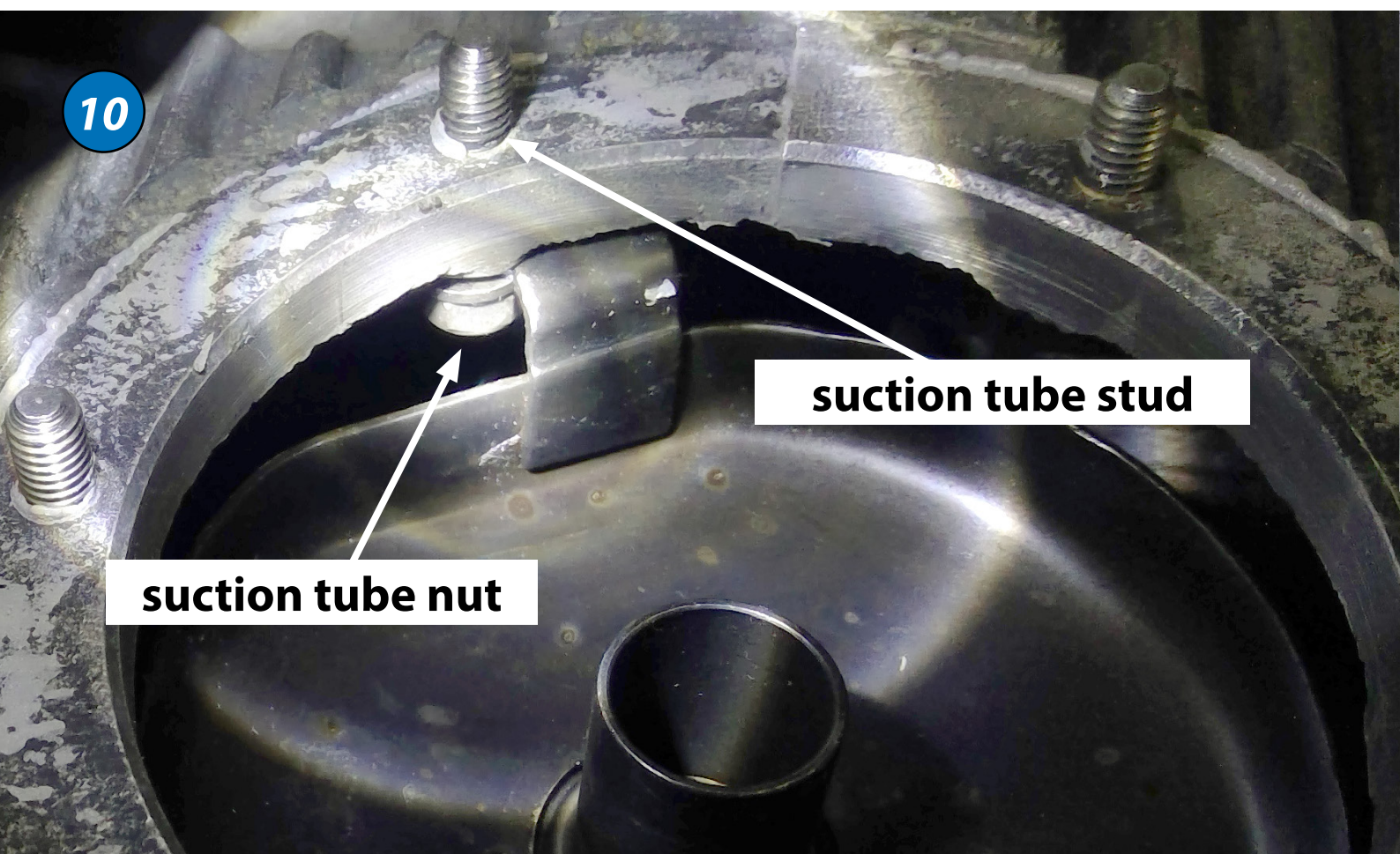
*Keep this measurement carefully in your service record, check the studs at every oil change to make sure the studs did not rotate when the sump plate was tightened.*

## Checking the sump plate stud length

If the thread of the studs is damaged, you will have to replace the studs first. In a next edition of this series we will show you how to replace the studs.

The biggest challenge is to replace the stud used to attach the suction tube and to remove and reinstall (picture 10). How to do that will be explained in a next edition.

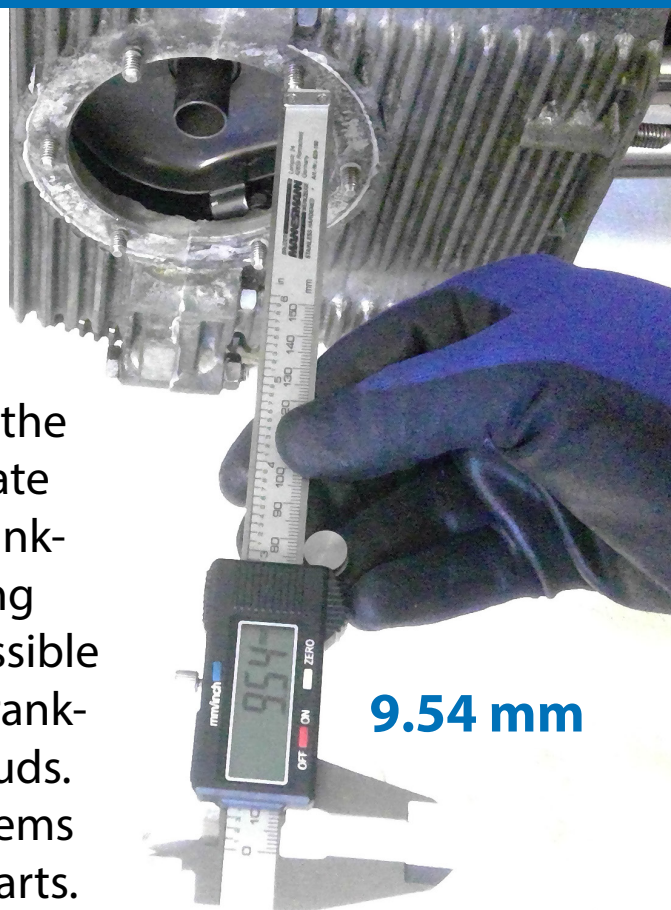
On the next page we show you how to use the M6 bolt with nut to check if the stud does not protrude too far. If the stud protrudes too far, the sump plate nut will get stuck on the stud and push it into the crankcase (even if the stud is tightened with Loctite).



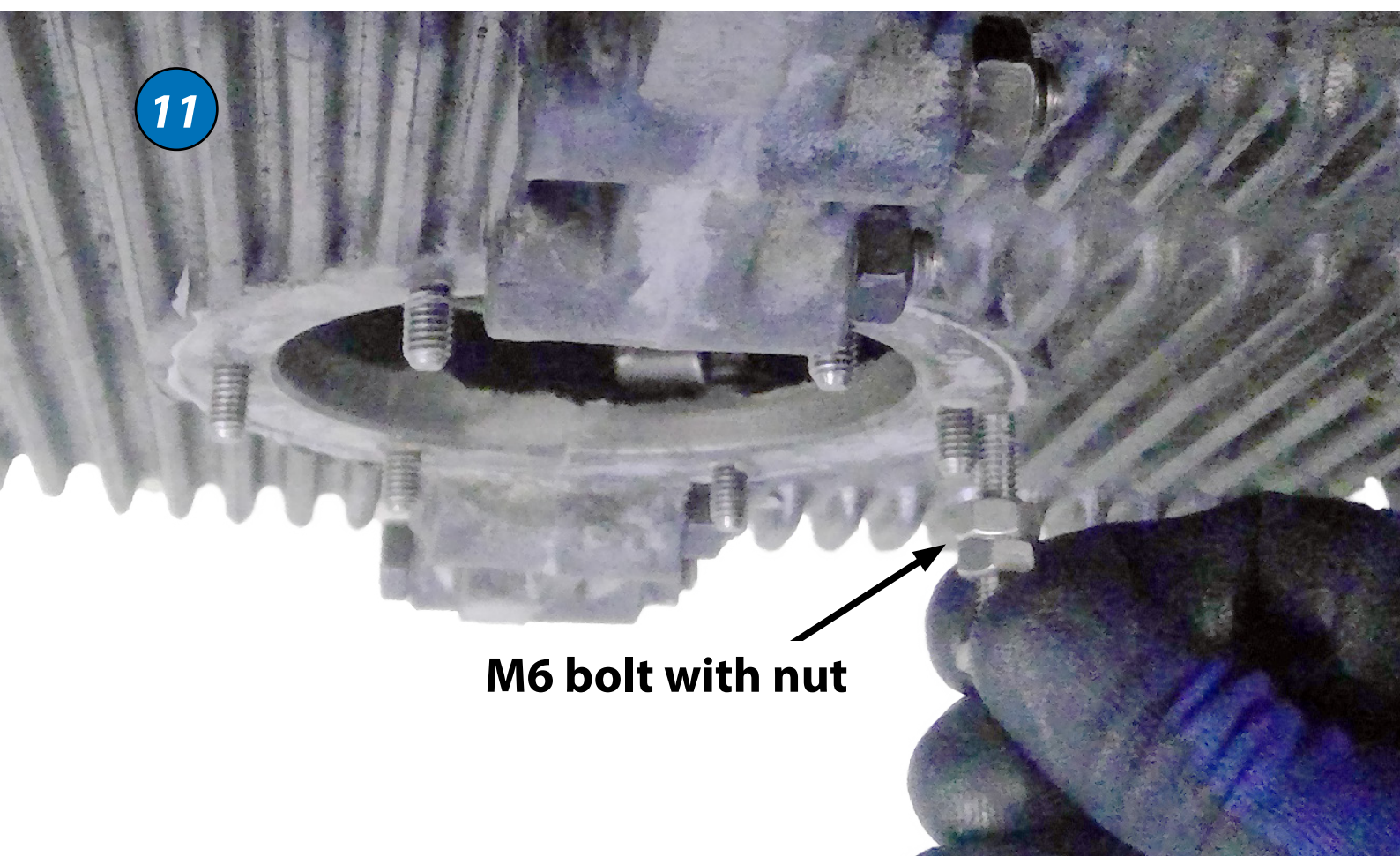


# sump plate stud length

You can also use a micrometer and compare the stud length with the measured length 12.05 mm on page 45. You can see that both the measurement with the bolt and the micrometer (9.54 mm) indicate that the studs are deep enough in the crankcase. So there is no danger of them getting stuck on the sump plate nuts, but it is possible that there is too little thread left on the crankcase cover nuts without damaging the studs. After checking the VW specs, 9.54 mm seems to be the correct length for original VW parts.



**9.54 mm**



**M6 bolt with nut**





On the picture above you can see that when all the gaskets are in place, only a few threads remain to secure the crankcase cover nuts to the studs. The whole thing will still be compressed when tightening to 7 Nm, so it will work after tightening.

Ideally the studs should be a little longer for the hardware used, but this will work. We don't need to make any adjustments for this crankcase.

### **Studs are too long**

On the picture above you can see that when all the gaskets are in place, only a few threads remain to secure the crankcase cover nuts to the studs. But it worked out fine.

### **Studs are too short**

If the studs do not protrude sufficiently from the crankcase, you risk breaking the sump plate nuts or worse, damaging the threads of the studs.





# sump plate stud length

It happens very often that the studs come loose when disassembling or mounting the crankcase cover. This can happen when the studs are not secured with liquid locking compound, or when the studs protrude too much from the sump plate, causing the sump plate nuts to jam on the studs.

We have explained in this article how to determine the stud length in order to avoid the previous scenario. Use liquid locking fluid (such as Loctite) to secure the studs at the correct depth to prevent them from coming loose. Setting the stud depth will be of little use if the studs rotate when loosening or tightening the sump plate nuts.

If you notice that the studs have come loose, you will have to adjust them to the correct depth and secure them with Loctite.

## two nuts technique

The loosening and twisting of the studs can easily be done with the two nut technique we explained in [edition 14](#). Then wait until the locking agent has done its job to tighten the sump plate nuts.

A full article on replacing and adjusting the studs will follow in a later edition of this series.









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