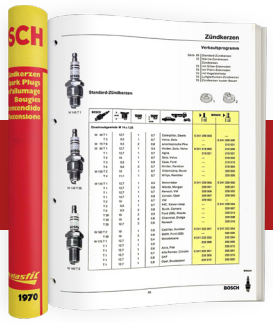
Paruzzi Magazine

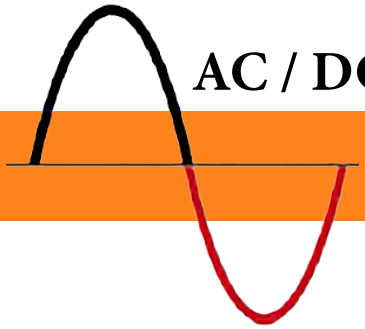
Technical Publication for the classic Volkswagen

17



#49- Electrical: spark plug codes

page 04



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Paruzzi
CLASSIC CAR PARTS

Introduction

Spark plug manufacturers use different codes to identify their spark plugs. It can be very confusing if you are not familiar with these proprietary brand codes. Worse, manufacturers such as Bosch, Beru, Champion and NGK use different codes to indicate the same specifications, and the order is also different. Spark plug manufacturers have also changed the coding over the years, which does not make the search for the right spark plugs any easier.

This becomes clearer when the letters and numbers that characterize a spark plug are discussed separately, and that is what we will do in this article. Spark plug coding will then have fewer secrets for you. At the end of this article we summarize the coding structure again, then everything becomes crystal clear.

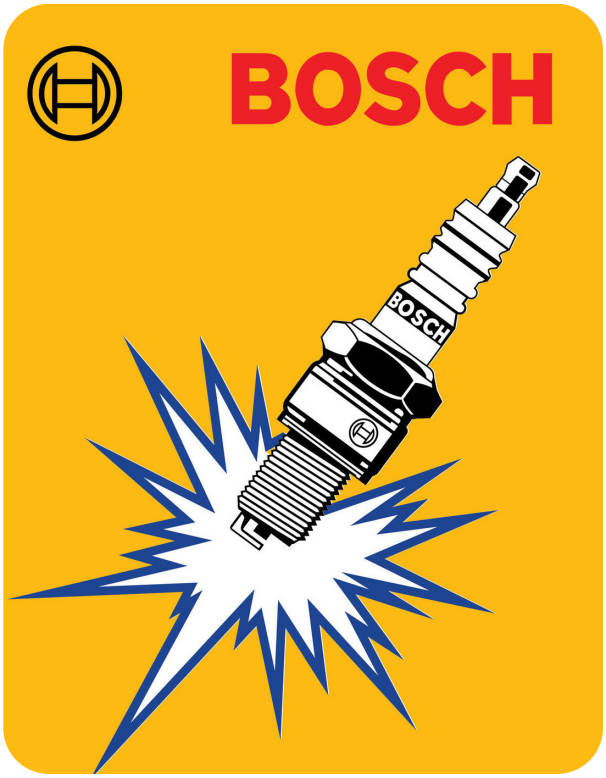
Our old Volkswagen garage manuals mention the old spark plug coding of the manufacturers, or the O.E.M. number of Volkswagen. If you have such an Vintage manual, then you will have to make the translation between the old and the new spark plug coding (see end of this article).

If you still have old spark plugs in the original VW packaging as found above, you will not use them but add them to your collectables, right?

spark plug codes

There are many different types of spark plugs available on the market. Just think of applications like motorcycles, garden tools, racing engines, air-cooled versus water-cooled VW engines...

The same types are offered by different brands. Don't panic, we'll get you started. In this article we will focus on the most commonly used spark plugs for our classic VW's only, to limit the information to our passion.



Spark plug specs

We will only discuss the characteristics that apply to our classic Volkswagens. There are many types of spark plugs, discussing all of them would lead us too far, and it wouldn't help you if you only deal with Vintage VW's.

What characterizes a spark plug?

It is the mechanical properties such as the length of the thread, the shape of the insulator and the nose, the shape of the electrodes and the number of electrodes, the degree to which heat is released, the materials used, specific applications (off-road, racing, small engines).

In the previous edition, we explained the construction of the spark plug and what "heat range" means. If you want to read more about this, please read edition 16.

The Bosch **W8AC** is the most used spark plug for the Type 1 air-cooled engine. Consult our e-shop to see all spark plug types, the type of VW engine they fit is listed in the e-shop.

But what do these letters and numbers stand for? What if you prefer to look for an NGK spark plug of the same type. Is that possible? Of course. For this we need to decipher the coding of the spark plug manufacturers...

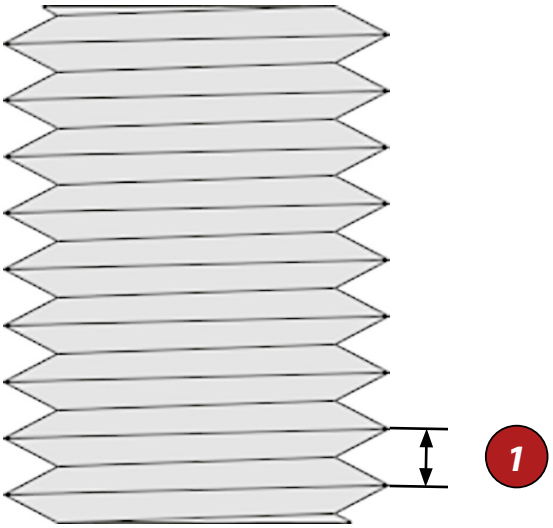
spark plug codes

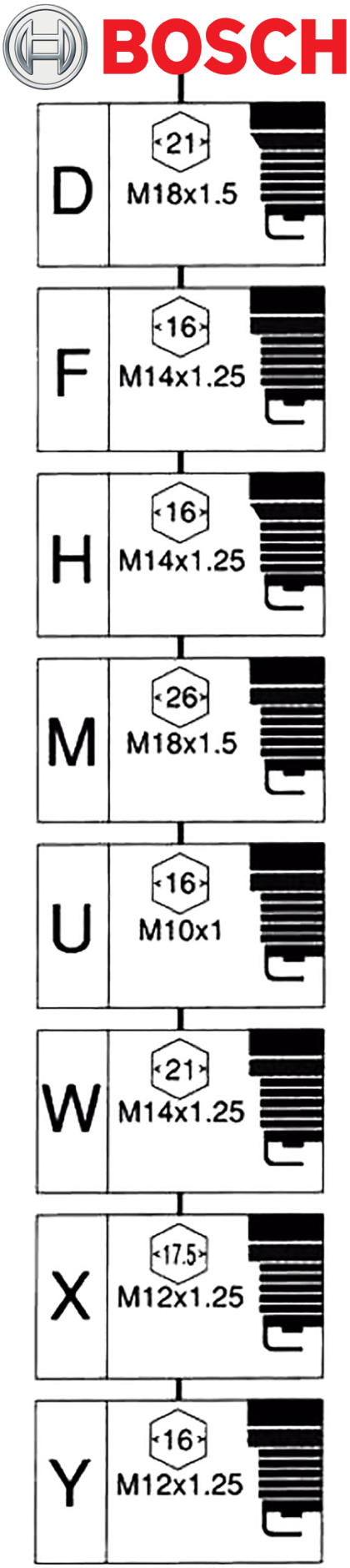
Spark plug thread

We will start with the first letter in the spark plug code of the Bosch W8AC, this is the **W**. The first letter indicates which type of spark plug thread is used. This must be the same as the thread of the cylinder heads. A small difference in size, for example 1.25 pitch instead of 1.00 will irreversibly damage the thread of the cylinder head.

The thread pitch is the distance between threads expressed in millimeters (measured along the length of the fastener), it is the displacement along the axis per revolution. The drawing on the right makes this clear, the distance between the two points (1) indicated by the double arrow is the thread pitch. The pitch is indicated in millimeters for metric threads, and in the case of English thread in the number of passes per inch.

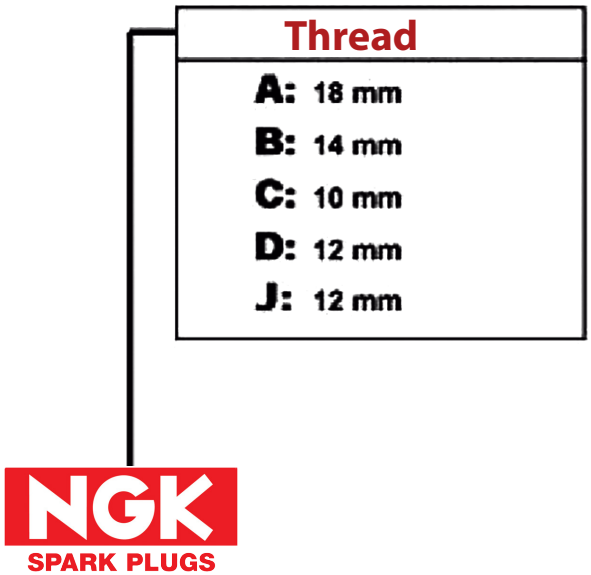
If you are in doubt about the pitch of your spark plug or cylinder head, you can always measure it with a special tool (2) like this one below. You can see what the **W** stands for at Bosch on the next page.





On the left we show an overview of some Bosch thread sizes available for the automotive industry. **W** corresponds to an M14 thread with an pitch of 1,25 mm (and a wrench of 21 mm). The first letter remains the same for the old Bosch coding. On page 4 you saw the original VW box with code **W**145, these old spark plugs also have an M14 thread with pitch 1,25 mm.

NGK uses a different coding (table below), the letter **B** stands for M14. The first letter has remained the same for NGK over the years.



spark plug codes

Champion uses the letter **L** for an M14 with a pitch of 1,25 mm spark plug. Champion can have a additional letter for the thread indication, this gives the type of resistance that is built into the spark plug. The **L** is actually the second letter of the Champion code.

The second letter of Champion combines both the dimensions and the shape of the thread (straight or conical) but also the length of the shaft. An **L** spark plug has a shaft of 12,7 mm long. Champion has much more second letters to indicate all combinations (from A to Z and combinations of letters). Consult the Champion tables to know all the codes.

A **spark plug thread**

B **spark plug shaft with thread**

C **terminal with thread and optional connection nut**

Heat range

We now know what the first letter means for Bosch and NGK (and the second letter for Champion). You have now found the correct thread for your VW.

The second code indicates the thermal degree of the spark plug (with Bosch one letter and with NGK several letters can precede this code, but these do not apply to our VWs).
In edition 16 we have explained what heat range means and why choosing a spark plug with the correct heat range (as indicated by the manufacturer) is important for the proper functioning of your engine. Our Bosch W8AC has a heat range code **8**. This does not mean that the thermal code is **8**. The same type of spark plug with NGK will have a heat range code **5**. These codes have nothing to do with the actual heat range value. The actual heat range value for a Bosch **8** is 145.

If you use spark plugs with the right heat range, the spark plugs operate between 500 and 900°C. This is hot enough so that the spark plugs burn themselves clean, but not hot enough to spontaneously ignite the mixture at the hot spark plug.

A higher number does not mean that the spark plug has a higher heat range. As explained earlier in edition 16, Champion and Bosch use higher numbers to indicate warmer spark plugs, NGK does the opposite. A Bosch with code **13** is the warmest type and **2** is the coldest type, while with NGK code **2** is hot and **11** is cold. You would get confused for less.

This leads to many mistakes in practice, because it seems more logical that the higher the number the warmer, right?

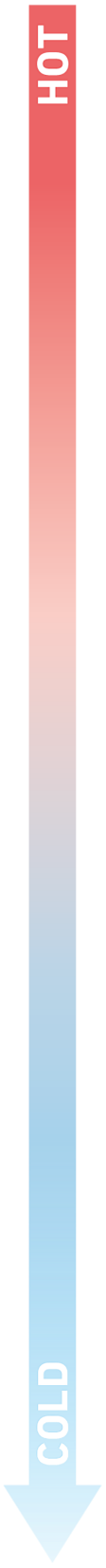
spark plug codes

Champion uses a much broader spectrum of numbers, ranging from 1 to 95, divided into automotive (1 is cold, 23 is hot), general (75 is cold, 95 is hot) and high-performance (53 to 63, all cold) applications. You can see that the numbers have no direct link with the absolute heat range value, so a 23 is warmer than a 63. We show the heat range table of Champion on the right, the values should become a bit clearer with this table.

Choosing which heat range is very easy when your engine is factory original. Just follow the workshop manual or the user manual that fits your engine type, which lists the spark plug types that should be used. If your engine is not original, ask the engine builder for the specifications.

CHAMPION

 Specific automotive applications	 General & industrial engine applications	 High-performance applications
23		
21		
20		
19	95	
	92	
18	91	
17	90	
16		
15		
14		
13		
12	86	
11		
10		
9		
8		
7		
6	85	63
5	82	61
4	81	59
	79	
	78	
3	77	57
	76	
	75	
2		55
1		54
		53

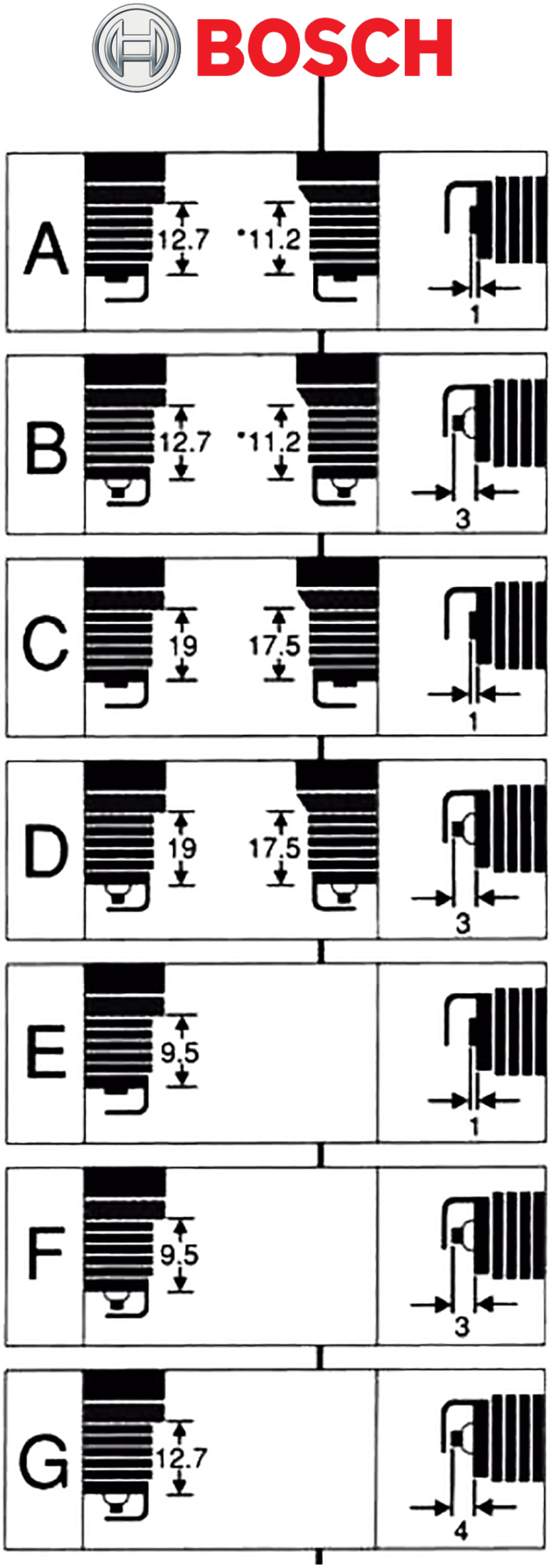


Spark plug shaft length

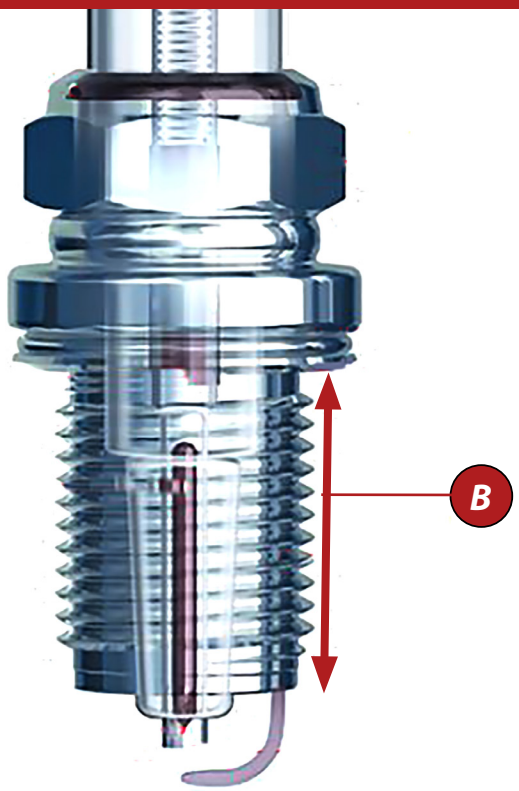
The following letter for Bosch and NGK indicates the length of the shaft (B on the drawing on page 13). If you screw spark plugs with too long shafts into the cylinder heads, you may damage the pistons. If the shaft is too short, the ignition will not be optimal. If the shaft is too thick, it will not fit in the cylinder head.

Warning, there are also conical spark plug shafts!

The drawing on the right shows the length of the shaft for Bosch spark plugs, there are of course more than seven, consult the tables of the manufacturer if you need other types. For our W**8**AC it is indicated that the length of the shaft is 12,70 mm. It also clearly shows how to measure if the lying surface of the sealing ring is conical (11,20 mm).



spark plug codes



We measure our W8AC with a micrometer, 12,67 mm indeed corresponds to 12,70 mm except for a small measurement error. Make sure you measure behind the washer, against the chassis of the spark plug.

The extent to which the central electrode protrudes is also indicated by this letter at Bosch, for a W8AC this is 1 mm (see drawing page 12).

With NGK, the **A** of the Bosch W8**A**C is replaced by an **H**. In the table on the right we show the NGK values, **H** corresponds to a shaft of 12,70 mm, identical to our W8AC. The table on the right is certainly not complete, please consult the manufacturer's data for more information.

The length of the shaft of the Champion spark plug is already given by the second letter(s) (see page 9 and table below). The Bosch W8AC corresponds to a Champion L86C.

NGK SPARK PLUGS — Spark plug shaft

E: 19 mm

EF: Conical 17,50 mm

FS: Conical 10,90 mm

H: 12,70 mm

L: 11,20 mm

S: 9,50 mm

Z: 21 mm

CHAMPION

FN	16 mm	M14 x 1.25mm	19 mm	Flat
G	16 mm	M10 x 1.25mm	19 mm	Flat
H	21 mm	M14 x 1.25mm	11.1 mm	Flat
J	21 mm	M14 x 1.25mm	9.5 mm	Flat
L	21 mm	M14 x 1.25mm	12.7 mm	Flat
N	21 mm	M14 x 1.25mm	19 mm	Flat
P	18 mm	M12 x 1.25mm	12.5 mm	Flat
S	16 mm	M14 x 1.25mm	18 mm	Taper
V	16 mm	M14 x 1.25mm	11.7 mm	Taper
W	24 mm	7/8"-18	16 - 19 mm	Flat
X	16 mm	M14 x 1.25mm	12.7 mm	Flat
Y	16 mm	M10 x 1.25mm	6.4 - 9.5 mm	Flat
Z	16 mm	M10 x 1.25mm	12.7 mm	Flat

spark plug codes

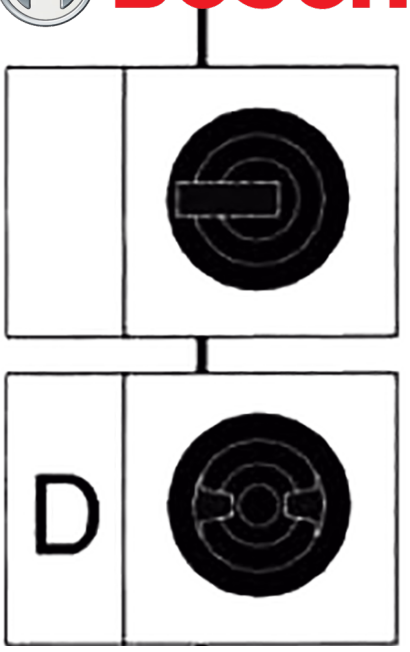
Electrode types

The following letter with Bosch and NGK indicates the shape of the electrodes. Our classic VW uses the standard electrode, which is the top one in the pictures below.
For Bosch, no sign is used for the standard electrode (blank), and for NGK this is the letter **S** (see NGK table on the right). This table is certainly not complete. For our VW's a standard electrode construction is sufficient.

NGK SPARK PLUGS — Electrodes

A:	Special Design	**N:**	Special Side electrode
B:	Special Design	**P:**	Premium Platinum
C:	Low Angle Ground Electrode	**Q:**	4-Ground electrode
CM:	Compact type, low angle ground electrode	**R:**	Special Ground electrode
E:	V-Grooved center electrode (14mm only) 1.5mm Insulator	**S:**	Standard 2.5mmø center electrode
ES:	Standard 3/4" Thread Reach (2.5mm) center electrode	**T:**	3-Ground electrode
F:	Tapered Seat	**U:**	Semi-surface discharge
G:	Fine wire nickel alloy center electrode	**V:**	Fine wire gold palladium center electrode
G-G:	Copper core ground electrode		
GV:	Gold-palladium center electrode Special Construction of V-Type. Racing use	**VX:**	High performance platinum
		W:	Tungsten electrode

BOSCH



#49 Electrical

Champion uses a series of letters, types of electrodes that you will probably never need if you only use air-cooled VWs.

The letter **C** will be found in the Champion code, this indicates that the central electrode is made of copper. That is the same **C** you see at Bosch at the end of the coding for our W8A**C**.

With Bosch, a letter may follow at the end, and with NGK numbers, but these are not so important for our application.

If you would like to know more about this, please consult the tables of the respective manufacturers.

CHAMPION

Centre Electrode	
C	Copper
G	Gold Palladium
W	Iridium
-	Nickel
P	Platinum
-	Steel
B	Fine Wire

# Ground Electrodes	
-	1
B	2/3
D	2
T	3
Q	4
1+2	1+2 side electrodes
1A	1 angled
1C	1 cut back

Ground Electrode	
-	Nickel
-	125 Nickel
-	Non
C	Copper
P	Platinum
F	Side-fire

Projection mm	
-	non
H	0,8
Y	1,4
	1,5
M	2,3
	3,0
L	5,1
E	7,4
D	8,4

Feature	
7989	Ford High Thread
X-plug	Ford Model T
X	Ribbed Core Nose
	Special Feature
V	Surface Gap
Z	Skirted Shell

spark plug codes

Terminal types

The last letter or number of Champion indicates the construction of the terminal (C). To the right we show the different types for completeness. The connection nut will have to be removed for most types of spark plug cables in our VW's, but this is certainly not always the case. Do not throw away the terminal nut by default if your spark plug cables are not standard.

ST	
TT	
-	
-1	

We have deciphered the complete coding for Bosch, NGK and Champion spark plugs. Each manufacturer uses a different coding, but the number of digits or letters is also different. Certain parts are sometimes not used, which makes it extra confusing. The following pages summarize the coding structure for these three manufacturers.

#49 Electrical

BOSCH

Shaft	Version	Heat Range
W	-	8
M14/1,25 mm	-	145

NGK SPARK PLUGS

Shaft	Construction	Heat Range
B	-	5
M14	-	145

CHAMPION

Product code	Thread/Shaft	Heat Range
R	L	86
SAC-9 resistance	M14/1,25 mm 12,70 mm	145

spark plug codes

Shaft	Electrode	Version
A	C	-
12,70 mm	copper	-

Shaft	Electrode	Luchtspleet
H	S	-
12,70 mm	standard	-

Electrode	Terminal	Air Gap
C	ST/TT	-
copper	removable nut	0,70 mm 0,90 mm

Old spark plug codes

I now consult all Bentley Publishing books I have in my workshop, as well as some original Volkswagen workshop manuals. They all indicate which spark plugs fit each engine, as well as the codes of different brands, unfortunately this is the old Bosch coding. In the table on the right I make an inventory of the spark plug types for the most popular Volkswagen types. I have put the new Bosch coding next to it, I think you can use this article to find the NGK codes yourself, nice brain training exercise. This is certainly not a complete list, but it certainly helps you on your way for the most common spark plugs for the classic VW.

VW type	
Beetle/Ghia/Bus 1131cc	
Beetle/Ghia/Bus 1192cc	
Bus	
Bus	
Beetle/Ghia	
Golf/Jetta/Scirocco	
VW T25/T3 Vanagon	
VW T25/T3 Vanagon	

spark plug codes

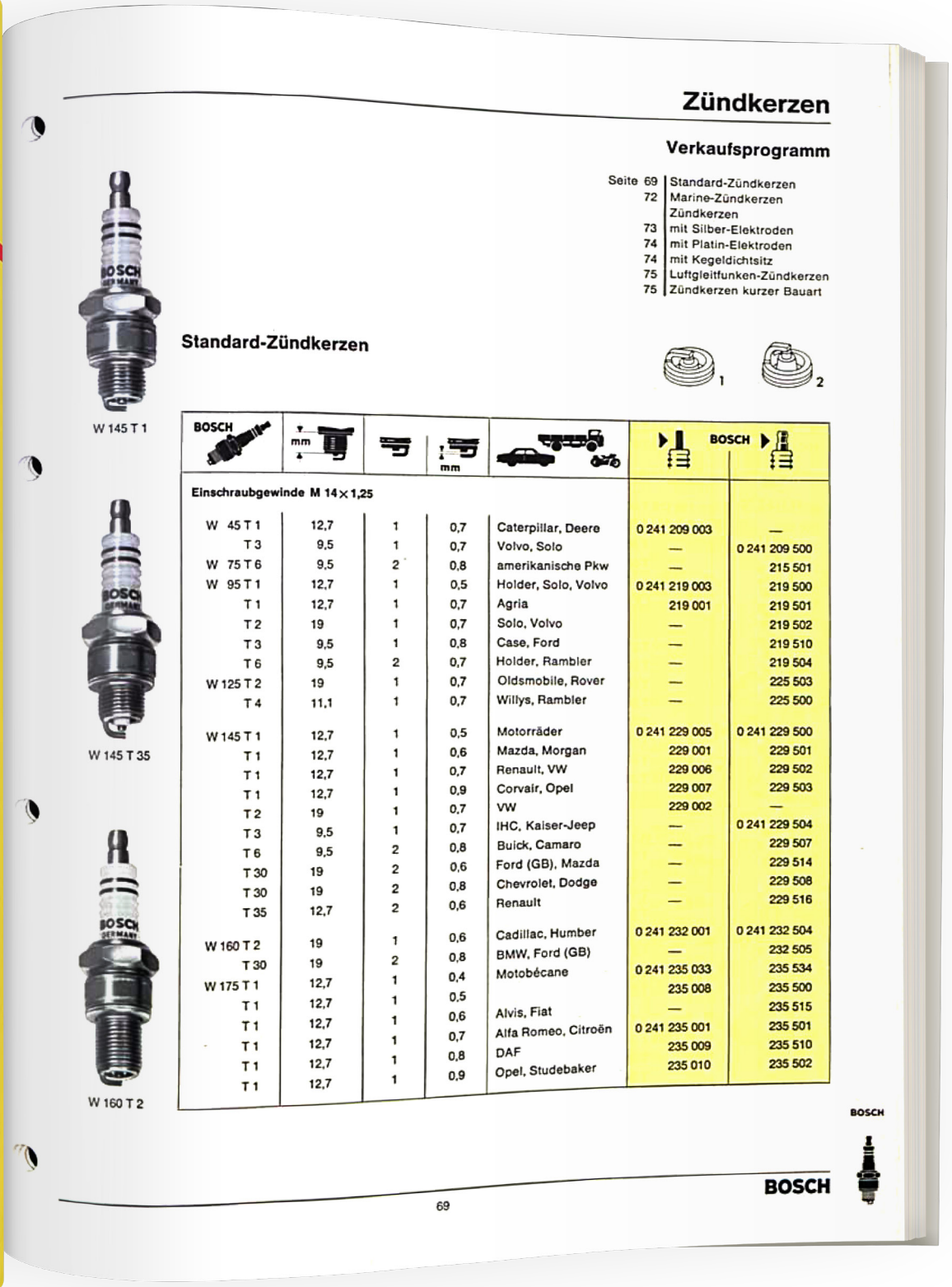
	models	old Bosch code	new Bosch code
	1950-1962	Bosch W175 T1	Bosch W7A
	1950-1962	Bosch W225 T1	Bosch W5A
	1963-1967	Bosch W175 T1	Bosch W7A
	1968-1979	Bosch W145 M2	Bosch W8C
	1966-1979	Bosch W145 T1 (normal drive)	Bosch W8A
		Bosch W175 T1 (sports drive)	Bosch W7A
	1974-1984	Bosch W175/225 T 30	Bosch W7D / W5D
	CV	Bosch W145 M2	Bosch W8C
	DH 1900cc water-cooled		Bosch W7C

The main differences lie in the heat range and the length of the shaft. In the old code T1 stands for a shaft of 12,70 mm and M2 or T30 for a shaft of 19 mm. The extent to which the central electrode protrudes is indicated by the old Bosch coding by the T1, M2 and T30. The latter protrudes 2 mm instead of 1 mm.

On the next page, a bit of nostalgia; an old Bosch spark plug catalogue showing the complete range up to 1970. I can browse for hours in that catalogue.

You can download this original Bosch catalogue (click on the cover below in the digital version of this magazine).

Below you see the old coding of Bosch. We have listed the new spark plug codes in the table on page 21.



Zündkerzen

Verkaufsprogramm

Standard-Zündkerzen

W 145 T 1

W 145 T 35

W 160 T 2

BOSCH	mm		mm		BOSCH	BOSCH
Einschraubgewinde M 14×1,25						
W 45 T 1	12,7	1	0,7	Caterpillar, Deere	0 241 209 003	—
T 3	9,5	1	0,7	Volvo, Solo	—	0 241 209 500
W 75 T 6	9,5	2	0,8	amerikanische Pkw	—	215 501
W 95 T 1	12,7	1	0,5	Holder, Solo, Volvo	0 241 219 003	219 500
T 1	12,7	1	0,7	Agria	219 001	219 501
T 2	19	1	0,7	Solo, Volvo	—	219 502
T 3	9,5	1	0,8	Case, Ford	—	219 510
T 6	9,5	2	0,7	Holder, Rambler	—	219 504
W 125 T 2	19	1	0,7	Oldsmobile, Rover	—	225 503
T 4	11,1	1	0,7	Willys, Rambler	—	225 500
W 145 T 1	12,7	1	0,5	Motorräder	0 241 229 005	0 241 229 500
T 1	12,7	1	0,6	Mazda, Morgan	229 001	229 501
T 1	12,7	1	0,7	Renault, VW	229 006	229 502
T 1	12,7	1	0,9	Corvair, Opel	229 007	229 503
T 2	19	1	0,7	VW	229 002	—
T 3	9,5	1	0,7	IHC, Kaiser-Jeep	—	0 241 229 504
T 6	9,5	2	0,8	Buick, Camaro	—	229 507
T 30	19	2	0,6	Ford (GB), Mazda	—	229 514
T 30	19	2	0,8	Chevrolet, Dodge	—	229 508
T 35	12,7	2	0,6	Renault	—	229 516
W 160 T 2	19	1	0,6	Cadillac, Humber	0 241 232 001	0 241 232 504
T 30	19	2	0,8	BMW, Ford (GB)	—	232 505
W 175 T 1	12,7	1	0,4	Motobécane	0 241 235 033	235 534
T 1	12,7	1	0,5		235 008	235 500
T 1	12,7	1	0,6	Alvis, Fiat	—	235 515
T 1	12,7	1	0,7	Alfa Romeo, Citroën	0 241 235 001	235 501
T 1	12,7	1	0,8	DAF	235 009	235 510
T 1	12,7	1	0,9	Opel, Studebaker	235 010	235 502

BOSCH

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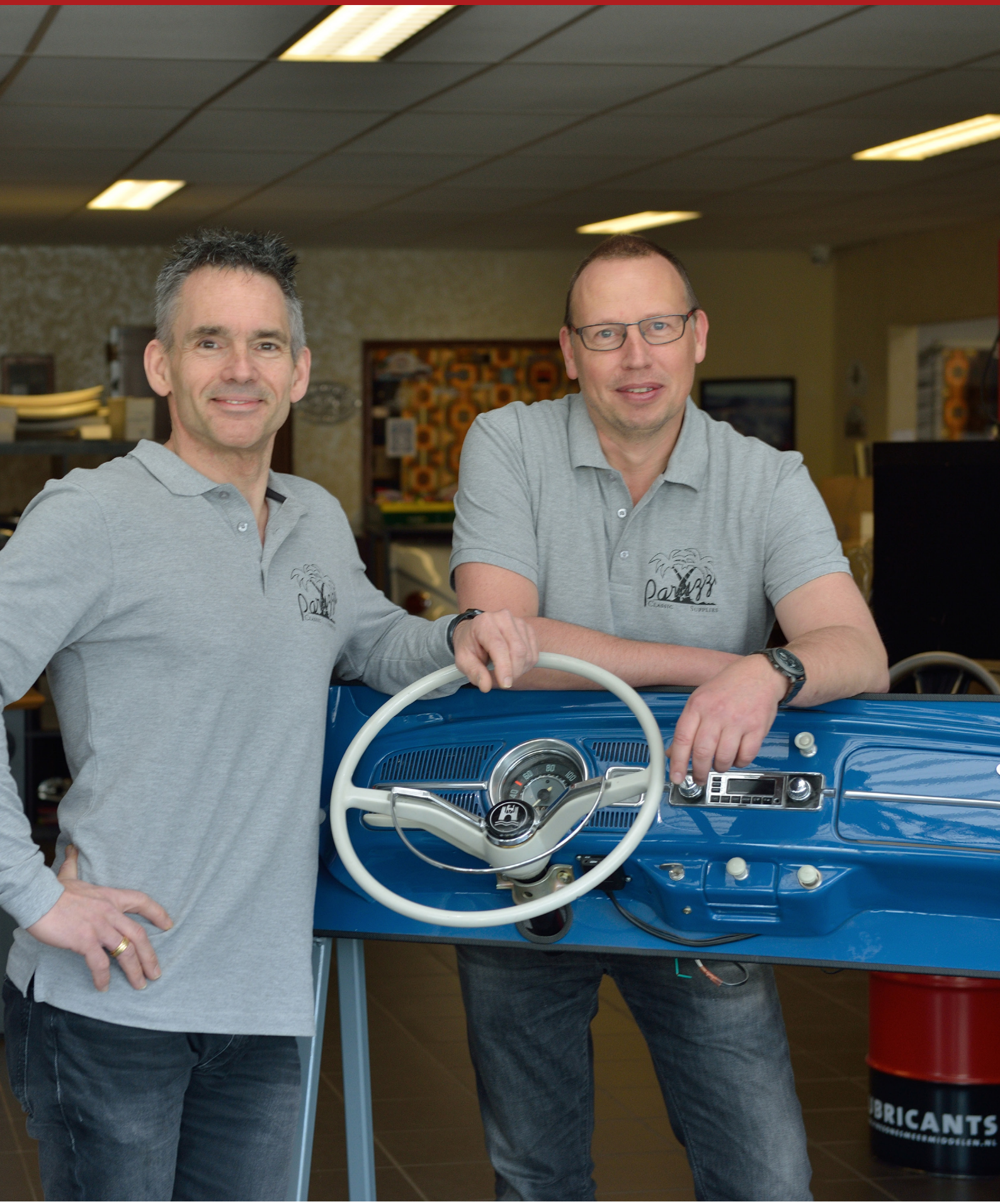
spark plug codes



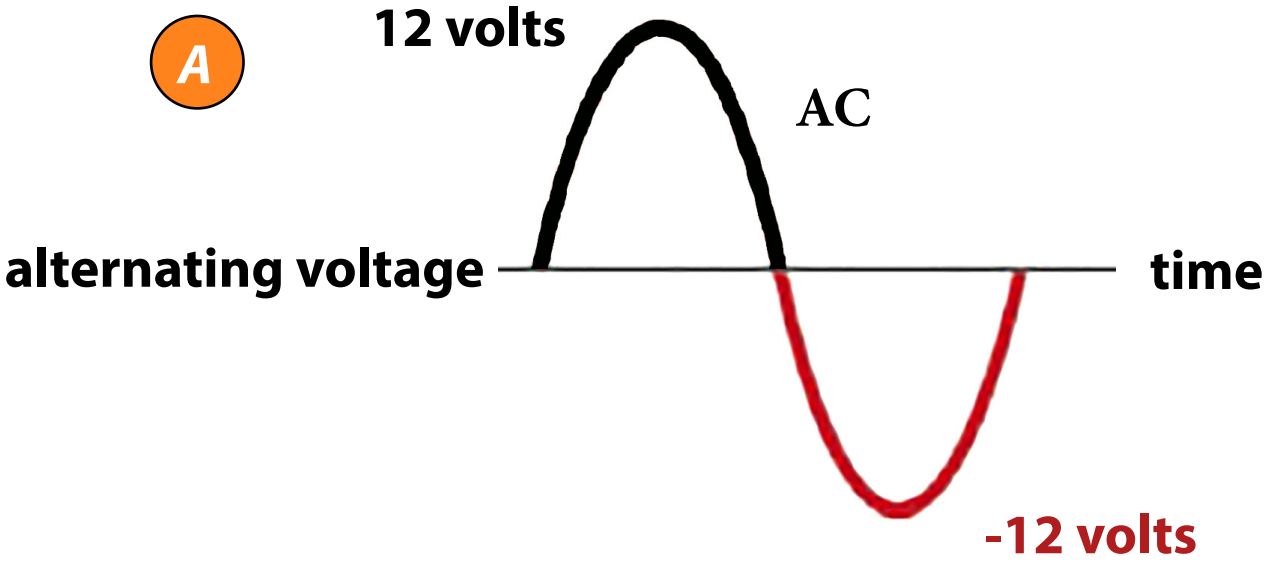
DC & AC

To understand the operation of the dynamo or alternator, capacitor or condenser, battery and ignition, we must first go back to basics and find out how the electric current necessary for our VW to work is generated.

The current for the electrical consumers such as lighting, radio, but of course also the ignition is generated by an electric generator; a dynamo or an alternator. The first generates direct current, the second alternating current.

The abbreviations you will find in the operating instructions are DC (Direct Current) and AC (Alternating Current).

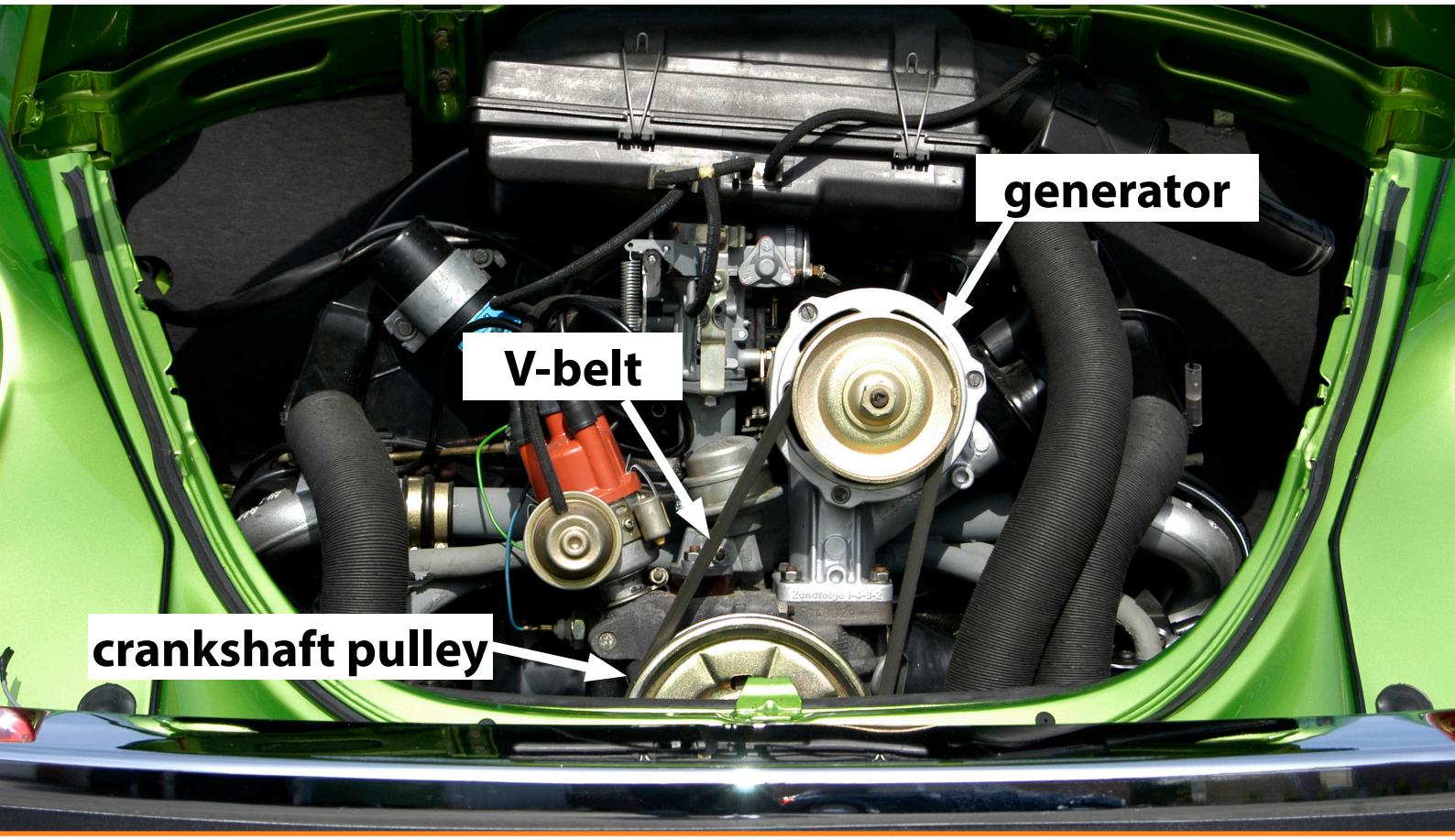
Below we show how the voltage varies from +12 V to O V back to -12 V inside a generator. This has to do with changing the magnetic field by the rotating movement of a coil (alternator) or magnet (alternator).



The generator is driven by the crankshaft pulley (picture below) via a V-belt. The course of the current and the voltage is sinusoidal as you can see in graph A. The faster the VW engine (read the crankshaft) is running, the faster the voltage will change from +12 volts to -12 volts. For a 6 volts installation, the voltage will fluctuate approximately between +6 volts and -6 volts.

However, a car needs direct current to function and the corresponding direct voltage (12 V or 6 V), a battery can only be charged by a direct current.

If you want to know more about voltage and current and the difference between 6 volts and 12 volts, read the article about this in edition 03.



Rectification

Each electric generator (dynamo or alternator) will first produce an alternating current (AC), which will then be converted into a direct current (DC) to be used by the electrical consumers of your classic Volkswagen.

Conversion from AC to DC is called rectification and is done by a rectifier, the result of rectifying an alternating current is shown in the graph on page 27.

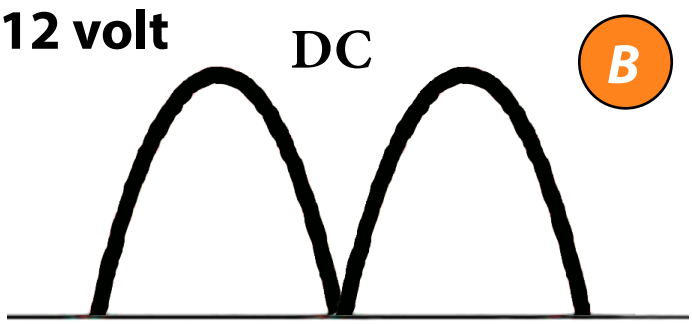
In a next edition we will explain how a dynamo and an alternator generate electric current and how the rectifier works.

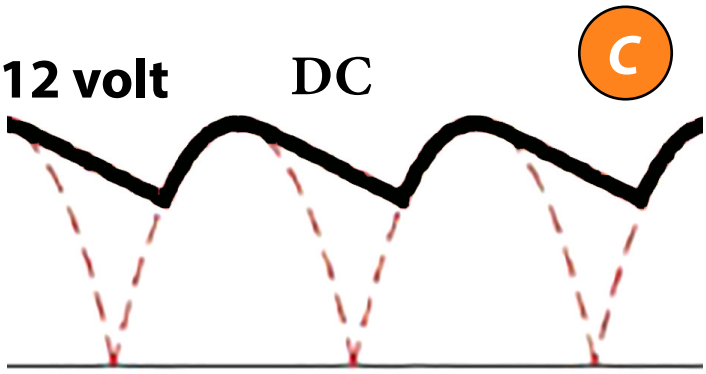
The construction of both types of generators is different, as is the way they convert the generated alternating current into a direct current.

There are many names to indicate the same when speaking about electrical generators. The direct current generator is usually called dynamo, but also direct current generator or direct current dynamo. The alternating current generator is usually called alternator, but also simply generator or alternator. For simplicity we will only use the terms dynamo (DC) and alternator (AC).

The **dynamo** does this internally, converting the alternating current into direct current in the dynamo by means of collectors that constantly exchange the polarity of the current.

The **alternator** uses an external rectifier to convert the alternating current to direct current.





The result is the same for both types of generators, the negative current and corresponding voltage is converted to a positive current and voltage, as shown in graph B.

But as you can see the course is not yet completely constant, so not yet usable for our VW. Ideally, the voltage would remain perfectly + 12 volts or + 6 volts without fluctuations. An almost flat current flow (graph C) is achieved by equipping the **dynamo** with several coils, in the **alternator** an external rectifier will smooth out the voltage and current.

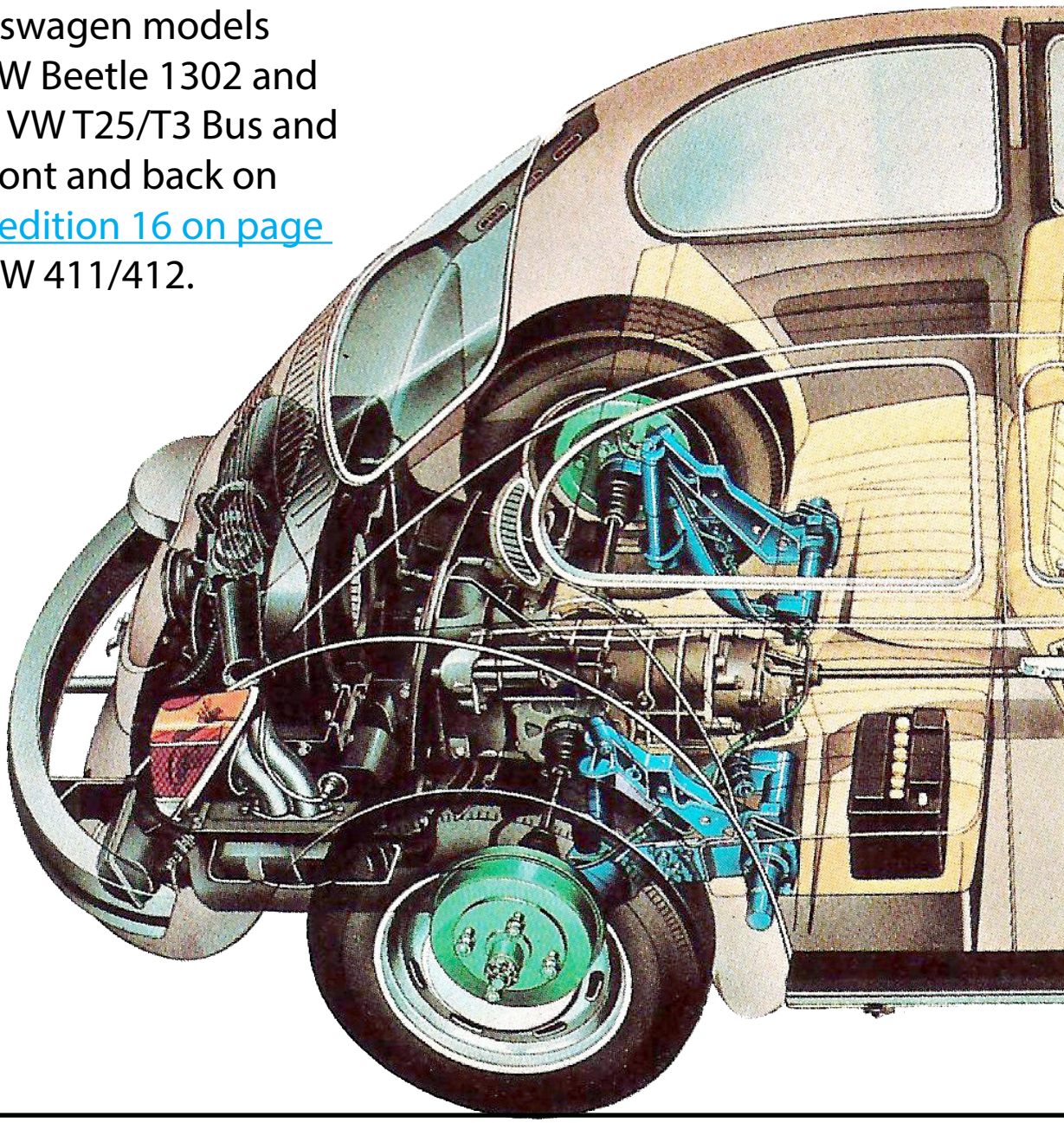
We have laid the foundations for the following articles on electric generators and consumers in this series. From now on it will only become more interesting and more practical.

#51 Front axle

Introduction

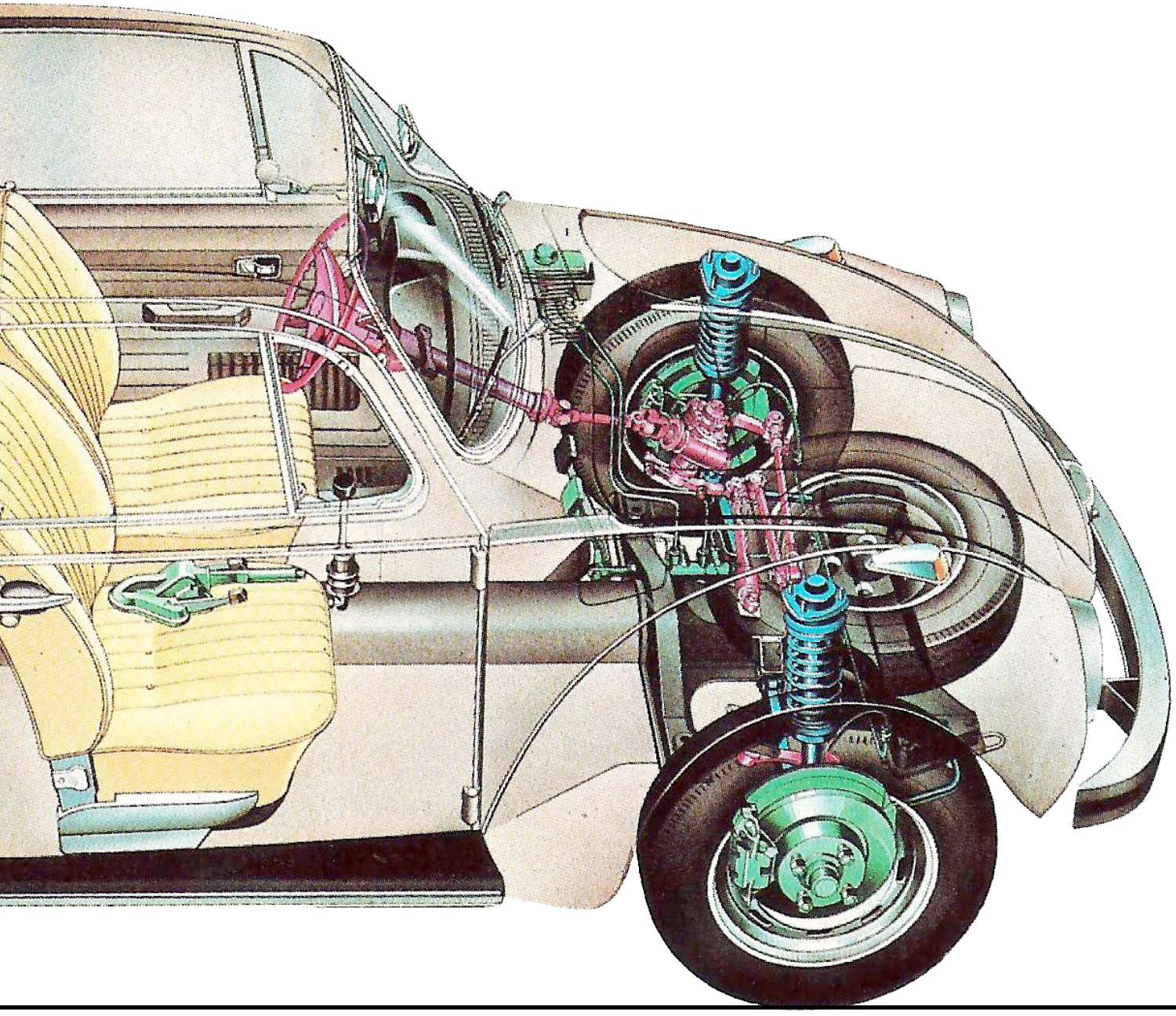
In the previous edition of this series (edition 16 on page 34) we explained how the independent suspension works. The MacPherson version can be found in the front on the younger Volkswagen models such as the VW Beetle 1302 and 1303 and the VW T25/T3 Bus and both in the front and back on the VW Golf (edition 16 on page 42) and the VW 411/412.

The advantages of this type of suspension compared to the classic torsion spring that we know so well from the older VW



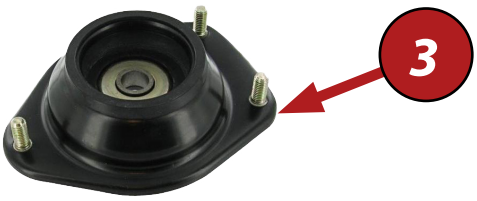
removing the MacPherson

were explained in the previous edition. Easy to replace, more comfort and better handling are just some of the advantages of this type of strut. Below we show a VW 1303 with the MacPherson struts in the front.



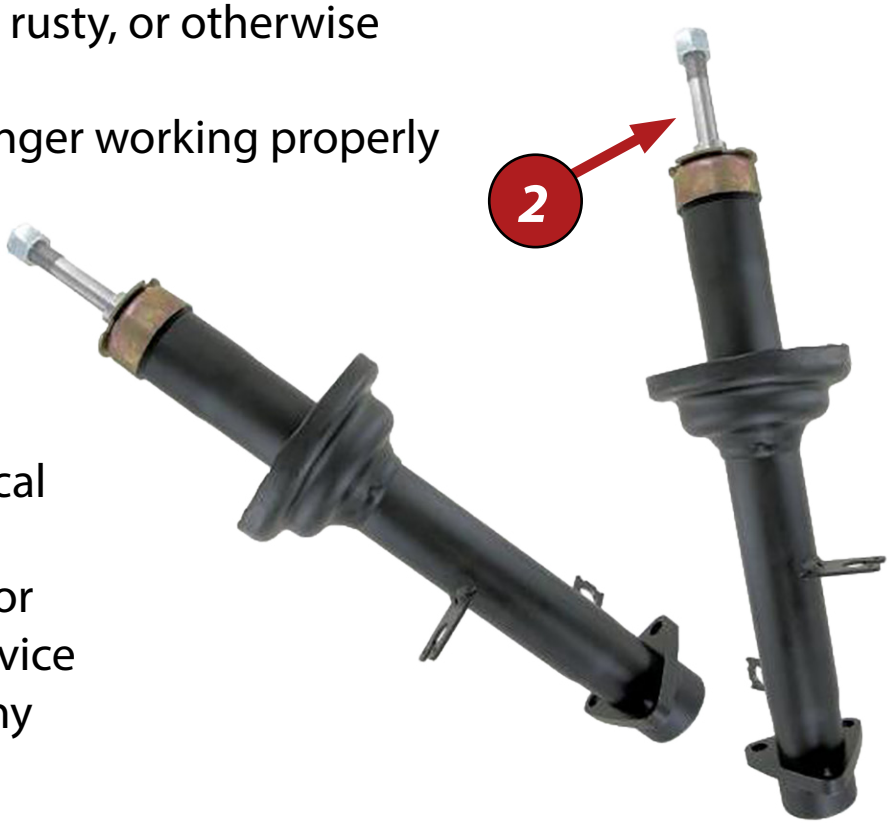
#51 Front axle

Diagnosis



Sometimes it will be necessary to remove the MacPherson for a number of reasons.

1. you want to install a shorter (lowered) or longer spring (1) (or set to factory standard again)
2. the spring is broken or strongly corroded
3. the shock absorber (2) built into the MacPherson leaks or shows signs of fatigue
4. the sheet metal on which the strut is attached with nuts under the front hood is damaged or corroded by rust, as a result of which the strut is no longer securely attached
5. the strut itself is deformed, rusty, or otherwise damaged
6. the top bearing (3) is no longer working properly



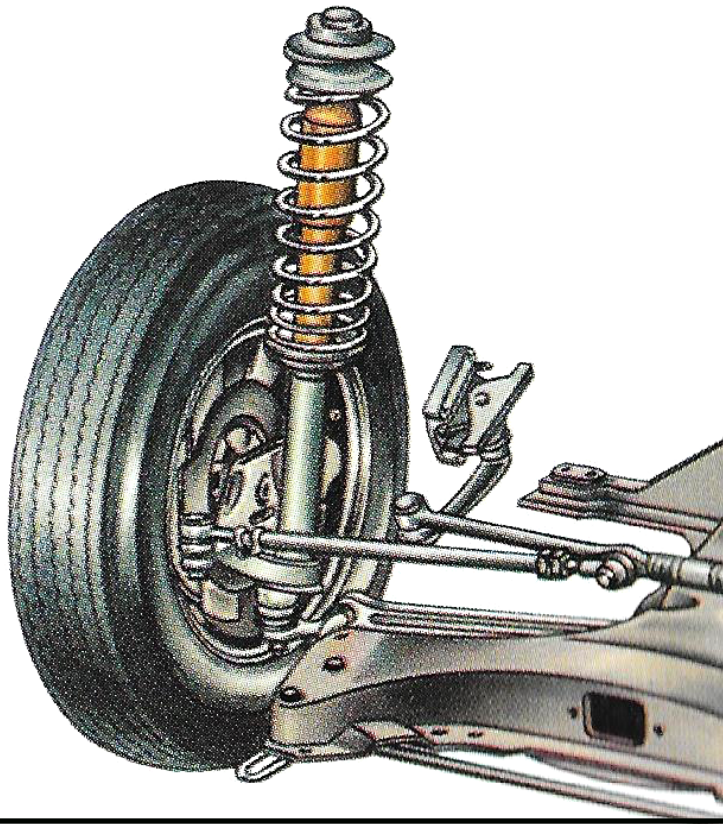
Making a correct diagnosis of the suspension is the job of experienced mechanics. They will see things that someone with limited technical knowledge will never see. Therefore, ask a professional or experienced mechanic for advice before you decide to make any adjustments or repairs.

removing the MacPherson

What you do on one side, you will also have to do on the other side. If you mount a new strut, shock absorber or spring on the left side, you should do the same on the right side to make sure the car is balanced.

If you have experience with a MacPherson suspension, for any brand, you can also work on a classic Volkswagen. The only condition is that you follow the guidelines of the VW workshop manual, respect the tightening torques (tightening torque with torque wrench) and if play values are given you also respect them.

If parts of the suspension are not attached properly, or too tightly, in the wrong order (washers or locking plates for example), or simply missing, this will not directly translate into the malfunctioning of the suspension, but it will cause rapid wear, heating and eventually breakage of certain parts. You really don't want the suspension to break.



#51 Front axle

We will use a VW Beetle 1303 (Super Beetle) to explain how to remove and install the front strut. The reason we decided to remove the MacPherson on this 1303 was because the spring did not turn with the turning movement of the front wheels. In edition 16 on page 49 we have shown this problem with three pictures.

In the video below (available in the digital version of this magazine) we show the same as in the photos of edition 16, the combination of the photos and the video make things clearer. If the spring does not turn, as in our 1303 before the repair, there is a problem with the strut mount bearing itself or with the mounting hardware. This was the reason to take a closer look at the strut.

Removing the MacPherson strut

Start by jack up the car at the front, we use a professional lift in our workshop. It works just as well with a hydraulic jack, follow the advice from edition 03 to safely jack up your VW!

Remove the front wheel by loosening the four bolts. The 1303's brake disc and caliper become visible (picture on the right).

Store all parts safely in boxes, keep them separate per disassembly phase, which will make it easier to assemble everything in the correct order later on.

At the end of this article you will understand that the previous owner did not do this, and thrown assembly parts together, hence the problem with the top bearing on this car.

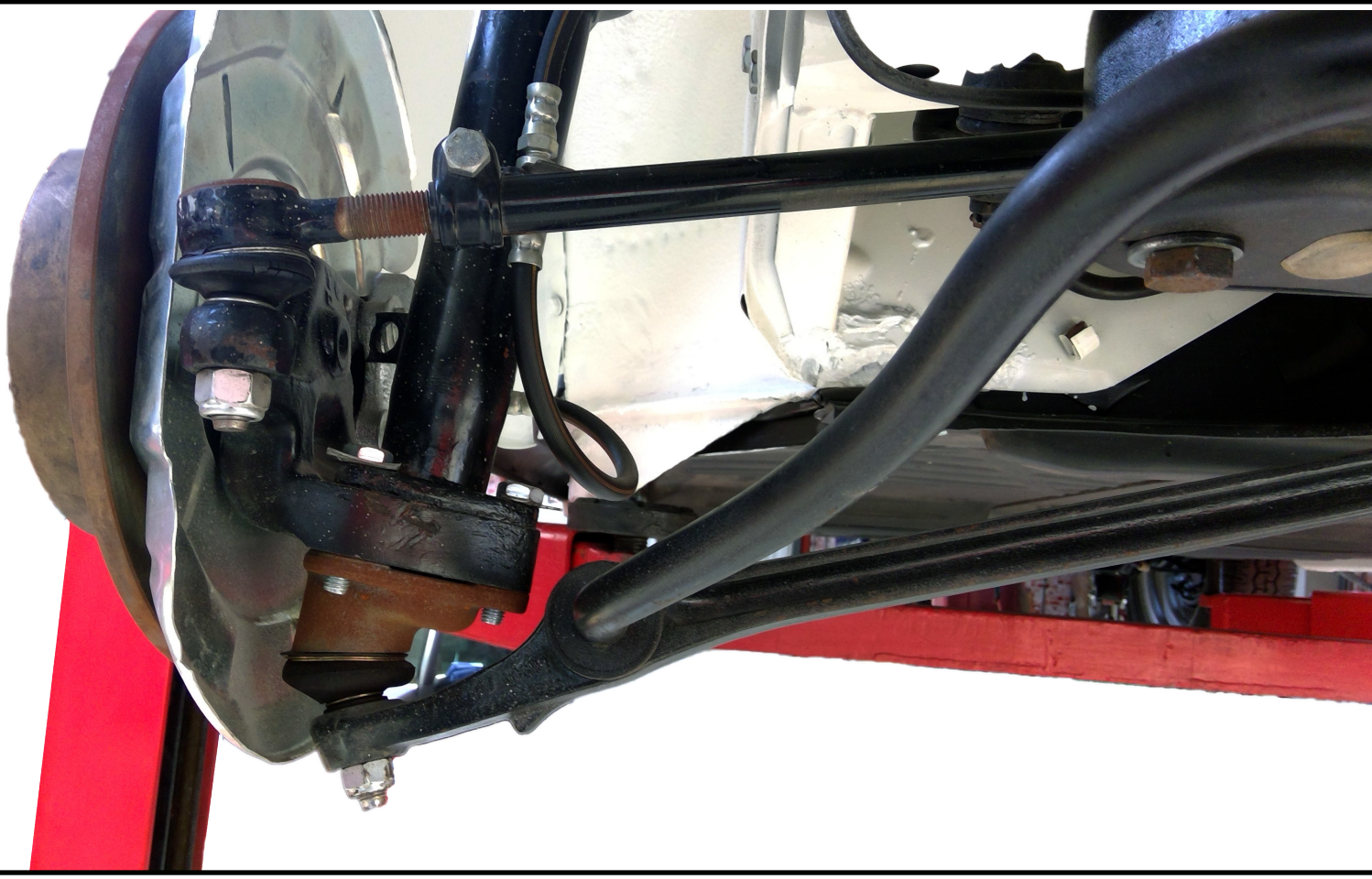
#51 Front axle

Strut types

Now that the MacPherson is clearly visible, you can see which type of strut is mounted under your VW 1303.

Two generations of struts were used for the VW 1302/1303, from 1970 to 1973 the strut was attached at the bottom, and from 1974 and later it was mounted on the side of the spindle.

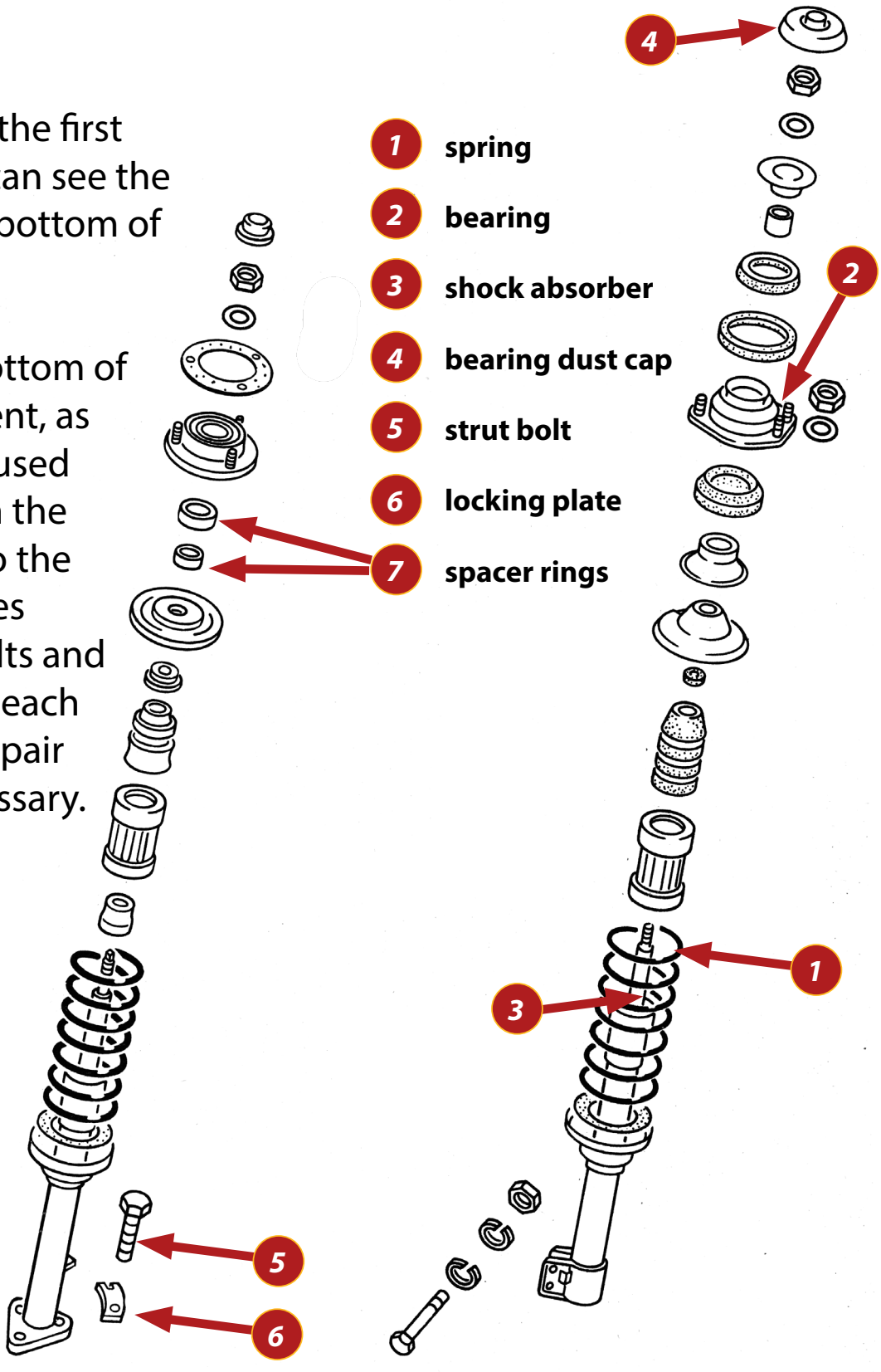
We have published pictures of it in the previous edition on pages 46 and 47 (see also page 49). We show the parts of both types in the technical drawings on page 35. It is important that every part is present, in good condition and correctly assembled according to the specifications mentioned in the VW 1303 manual.



MacPherson uitbouwen

Our 1303 is from the first generation, you can see the difference at the bottom of the strut.

Loosening the bottom of the strut is different, as well as the parts used as you can see on the drawings but also the tightening torques (tightening of bolts and nuts). Check that each part is present, repair or replace if necessary.



1970-1973

1974 and later

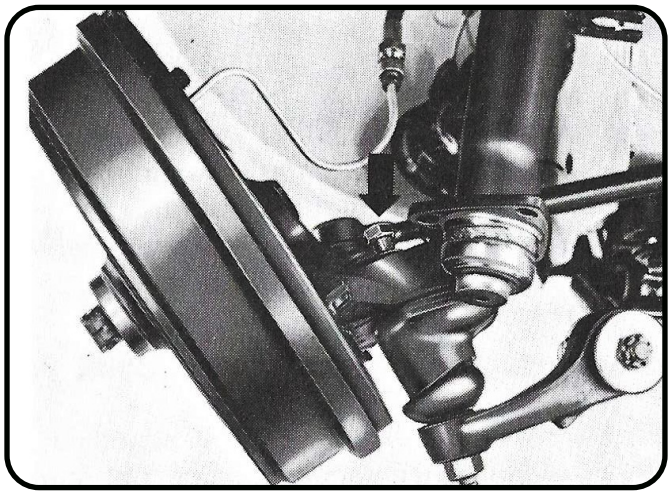
#51 Front axle

Removing the disc brake and spindles?

The European VW 1303 was equipped with front disc brakes as standard, unlike the USA version which had factory fitted drum brakes. The calipers and discs do not have to be removed to be able to removed the struts.

We did so because we know from experience that the strut is rusted on the disc brake spindle if the car has not recently been thoroughly restored. To save work you can leave the discs and spindles in place, there is less space to work comfortably though. If the strut is rusted on the spindle then it will be a heavy job to get them apart, heating them with a burner will be necessary in most cases.

I consult the Volkswagen workshop manual (picture below), and indeed, the factory does it without removing the spindles and discs, but that is no problem when the car is quite young, this is not the case here.



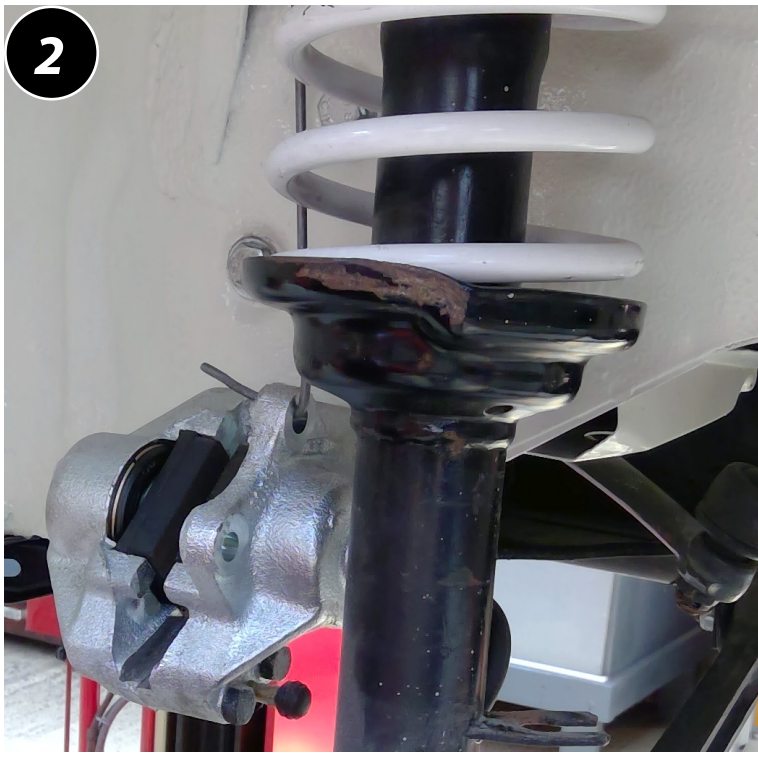
If you remove the discs, you will have to adjust the play on the front wheels. This is a very important operation, if this is not done properly, the conical bearings of the front wheels can break!

removing the MacPherson

The brake lines through which the brake fluid flows do not have to be disconnected, this way you avoid having to vent the brake circuit!

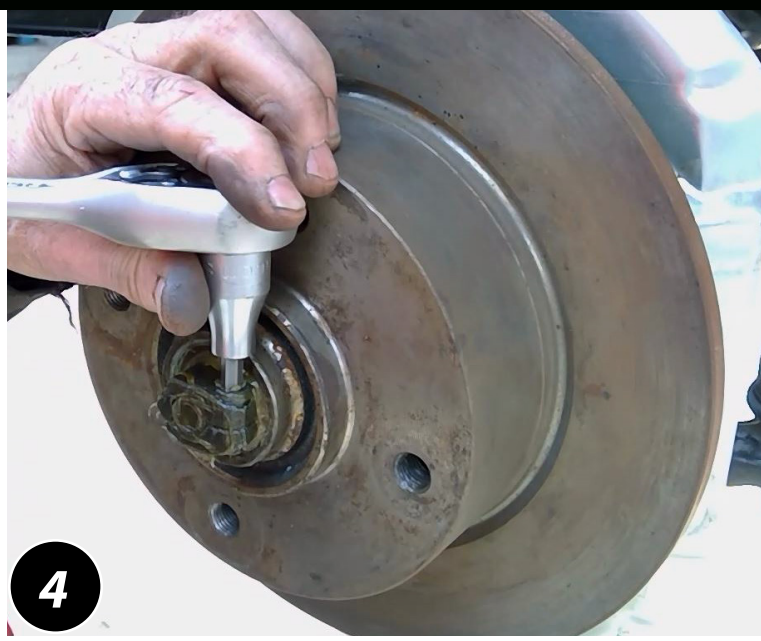
Loosen the bolts (1) that attach the caliper to the spindle. Carefully slide the caliper off the disc and make sure it is not in the way. We use a thin metal rod (2) that we bend, the top is hanging on the spring of the strut, the other side on the caliper.

Remove the dust cap (3) covering the adjustment nut using a large screwdriver. Under the cap there will be a lot of grease present, just clean it to make it easier to work.



#51 Front axle

Loosen the small tensioning bolt (picture 4) with a 6 mm Allen key. In the left spindle is the cable for the odometer, you have to loosen this cable on the side of the left wheel and securely fasten it so that it doesn't get in the way to remove the front strut later on.

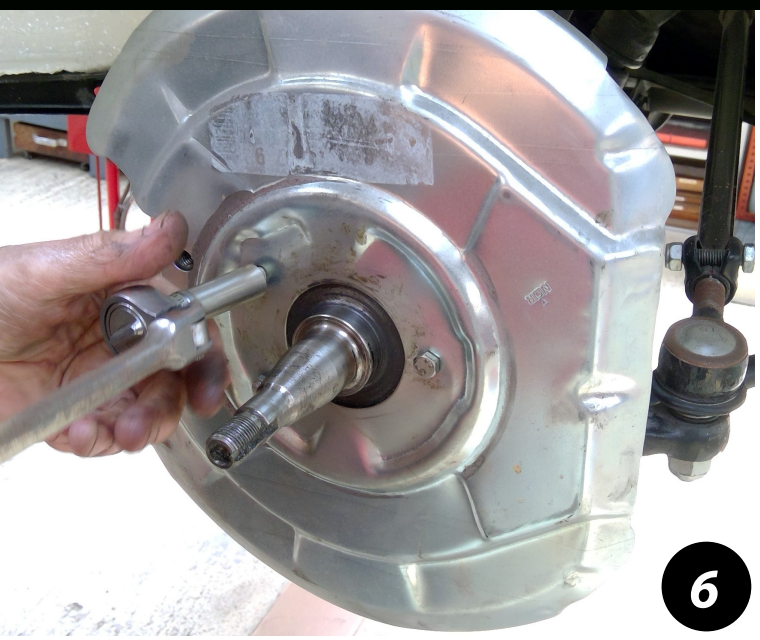


Please note that on the right a "normal" nut with right-hand thread is used, on the left a nut with left-hand thread is used!

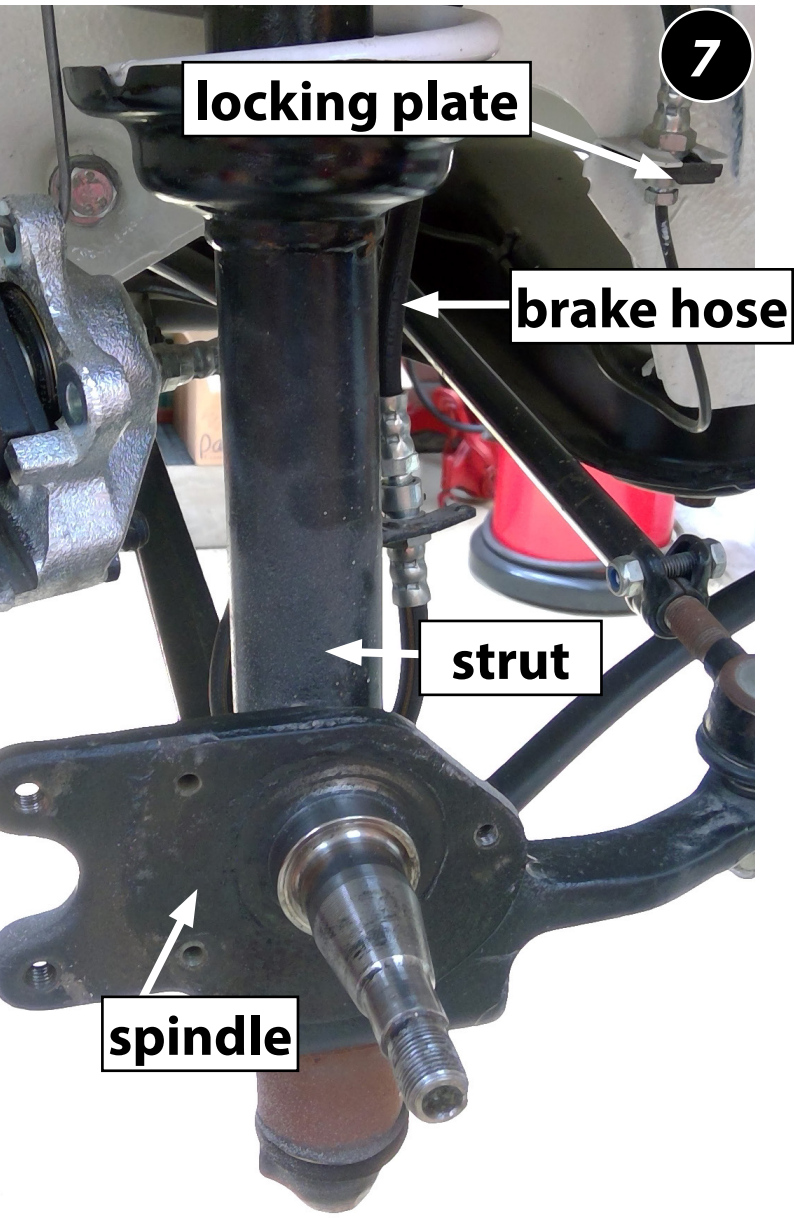
Then loosen the nut (5) that holds the disc on the spindle. Note, on the left side this nut has a left thread, this means you have to turn the nut clockwise to loosen it, just the other way around! If you don't know this, and you think the nut is stuck and apply extensive force, you might damage the conical bearings. So pay attention!

The right side has a "normal" nut with right hand thread, so counter-clockwise to loosen. Both wheels use a different type of thread to prevent the nut from loosening while driving, for safety reasons.

removing the MacPherson



You can now see the brake backing plate (6). You can remove this by loosening the bolts. Once the brake backing plate is removed, you will see the spindle, with the strut behind it. The brake hoses are attached to the strut with metal washers (8).



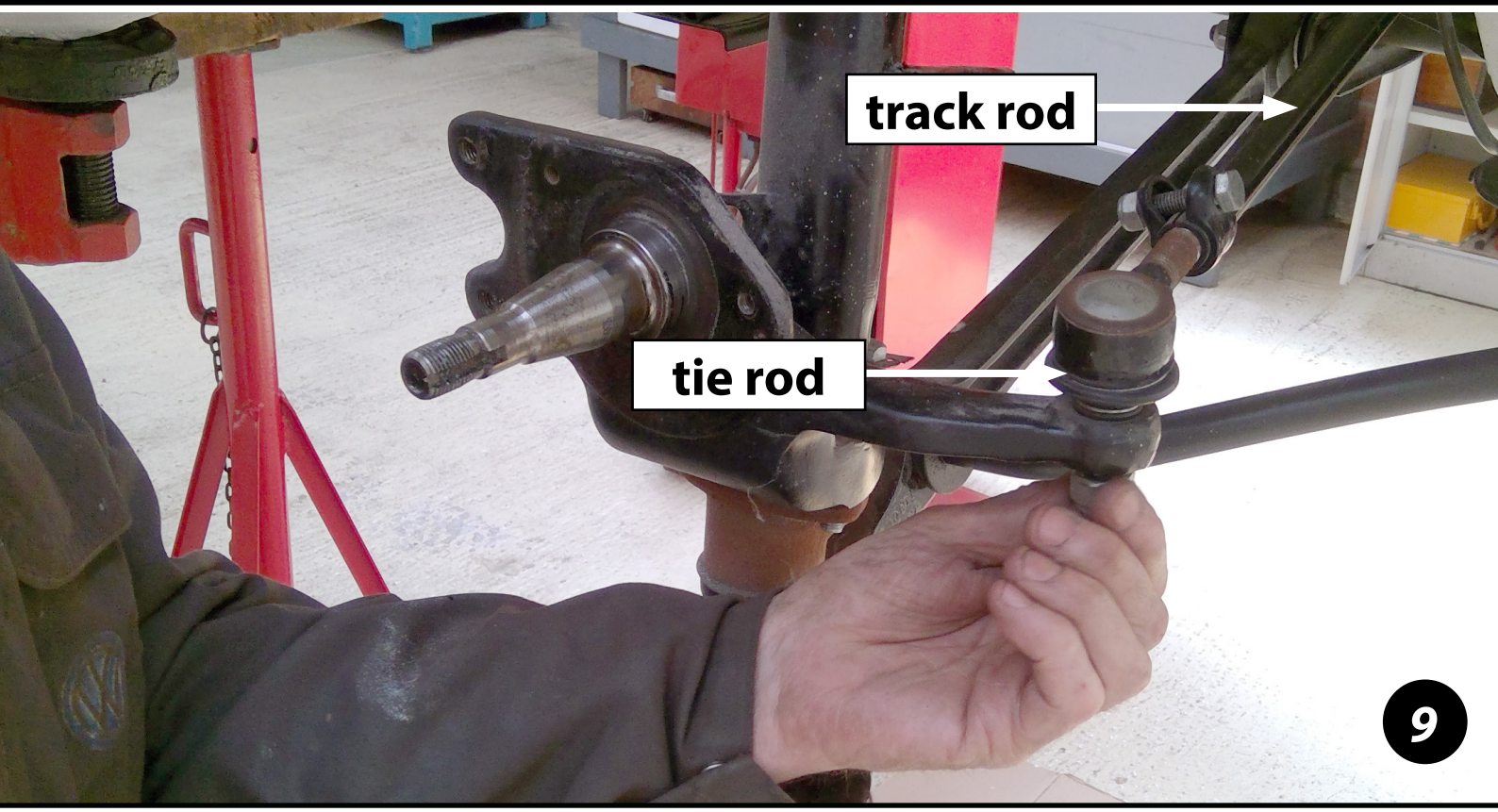
All you have to do is loosen the brake hose locking plate that is attached to the strut itself.

We loosened all the brake hoses because we had to replace them. If you also removed the brake hoses, you will have to vent the brake circuit.

Loosening the tie rod

Even though you have decided to leave the brake discs and spindles in place, the track rod must be loosened. Loosen the nut at the bottom of the tie rod. Then you can push the tie rod with track rod out of the spindle.

The tie rod has a conical end that just fits in the hole of the spindle (only with the 1st generation strut), it will be tight, pushing out by hand will not work, using



removing the MacPherson

a hammer on this type of part is not recommended, you could affect the adjustment of the track and cause damage.

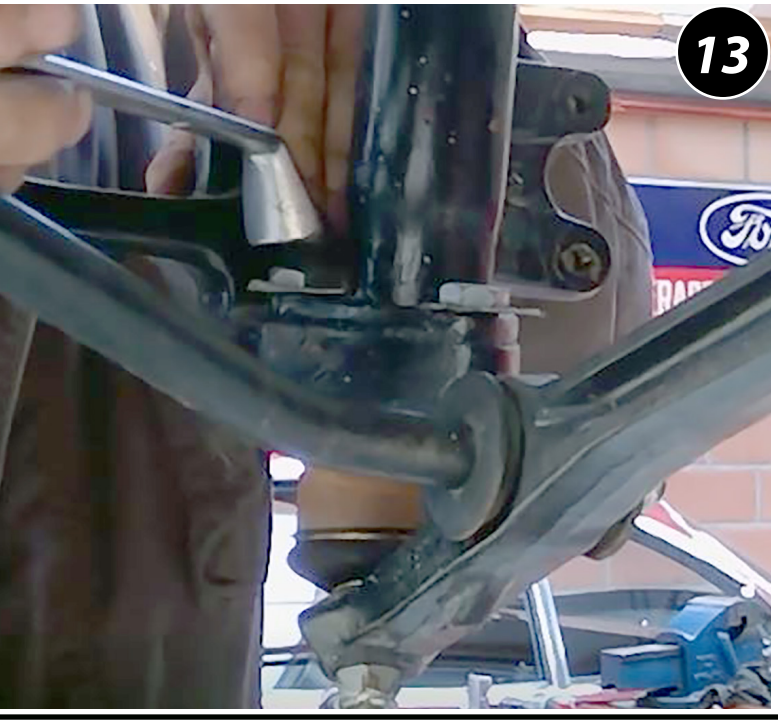
With this simple tool (picture below, only for the 1st generation strut) you can push the tie rod out of the track rod without force and therefore without damage (pictures 10, 11).
You can let the track rod rest on the torsion bar (12).

Removing the strut

Loosen the three bolts (picture 13) that attach the strut at the bottom to the wishbone. These bolts are secured by means of locking plates (picture below, only for the first generation struts), on our 1303 the locking plates were mounted incorrectly. The VW workshop manual advises not to use the washers again.

Now you have to loosen the three upper nuts of the strut, which can be found under the front hood (picture 14).

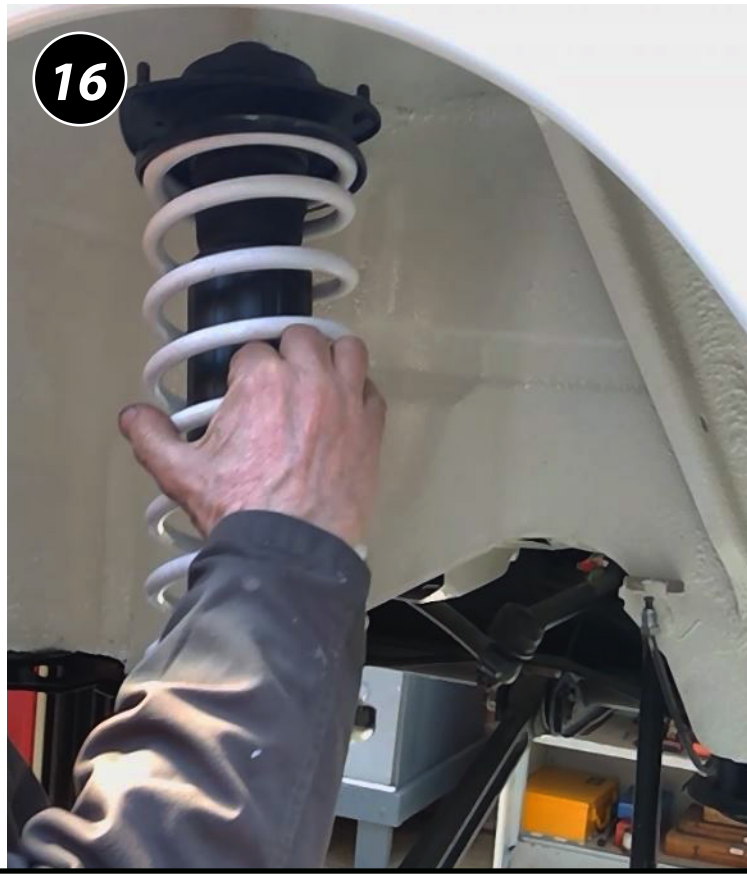
The spring in our VW 1303 is of the lowered type, a shorter spring than what was mounted in the factory. But even with the original longer spring, it is not necessary to tighten the spring to remove the strut. The MacPherson strut comes out as a whole.



removing the MacPherson

The strut can now be removed by lifting the whole (strut with spindle) and pulling it from under the mudguard (15 and 16).

Attention, the whole thing weighs a bit! Make sure the spindle doesn't come loose from the strut, with our 1303 both were very corroded and with extra black paint so to speak glued together. Maybe this is not the case with your 1303!



Removing the strut mount

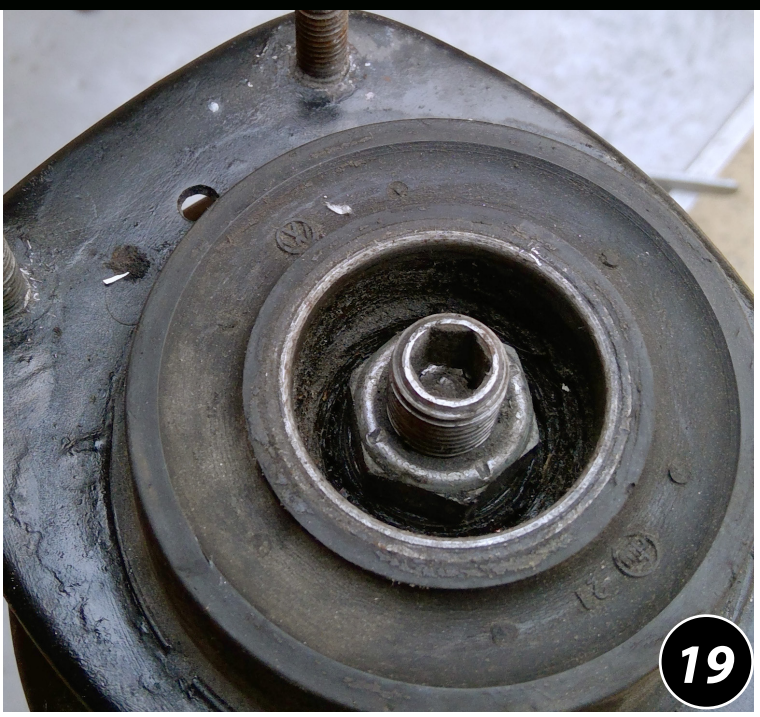
On picture 17 you can see the MacPherson strut removed from our VW 1303, at the top you can see the dust cap that protects the roller bearing.

The problem with our 1303 Beetle was that the MacPherson spring didn't turn when the wheel was spinning, the roller bearing should make sure it can. Either the roller bearing is rusted, damaged, dirty, or it's something else. To know that, we need to disassemble the strut mount to inspect the bearing.

We clamp the strut in our vice and use aluminium protection plates (or plastic) to prevent damage to the strut (see picture 18). We compress the MacPherson spring using a spring tensioner (picture 18).


17

removing the MacPherson

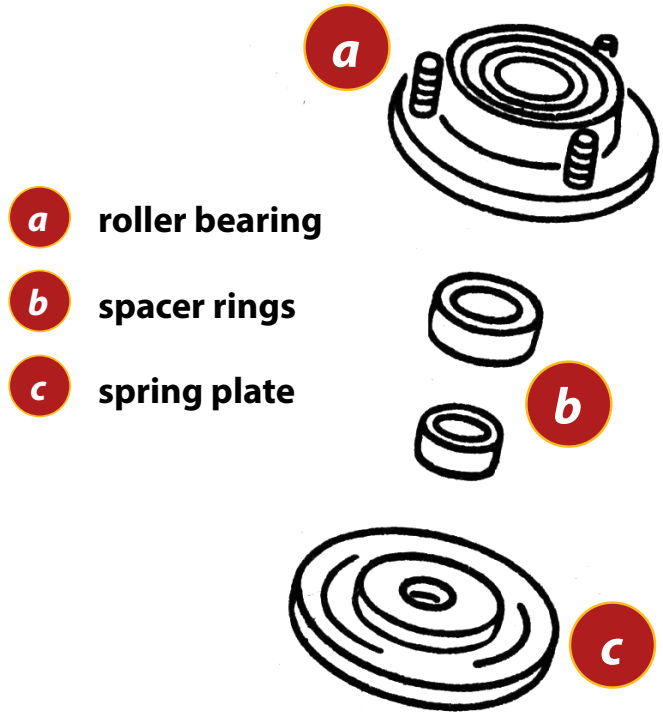


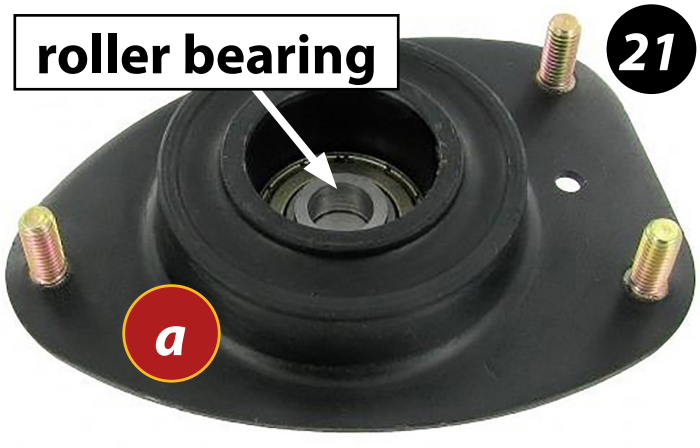
The top bearing is fixed with a nut and an Allen screw (19). We had to use a steel pipe to be able to put more force, otherwise the nut would not come loose (20).

#51 Front axle

Picture 22 shows the strut once the roller bearing is removed, you see the spring plate (c). The bearing (a on picture 21) turned out to be very dirty, you heard it when the bearing was turned around by the sandy sound, but there was not much wrong with the bearing. After a thorough cleaning and refilling with bearing grease, it could be used again. The problem were the spacer rings, they didn't have the right sizes and as a result the bearing couldn't perform its function properly. On the drawings you can see the distance rings between the top bearing and the spring plate (VW 1303 from 1970 to 1973, see also drawings page 35).

The nut is tightened with a torque between 70 Nm and 85 Nm (this is for the 1st generation strut, for the 2nd generation it is 60 Nm).





Installing the MacPherson

We are now ready to install the MacPherson strut again. The spring tensioner can be released.

The installation is done in the reverse order of the removal. Pay attention to the following details when installing the strut.

The three strut bolts (23) at the bottom may be tightened with a torque wrench set to 40 Nm. Mount the washers correctly and secure them correctly with a chisel as shown in pictures 23 and 24, and not otherwise! Use a lick of green paint for example to indicate that the bolts are tightened to torque (handy reminder).

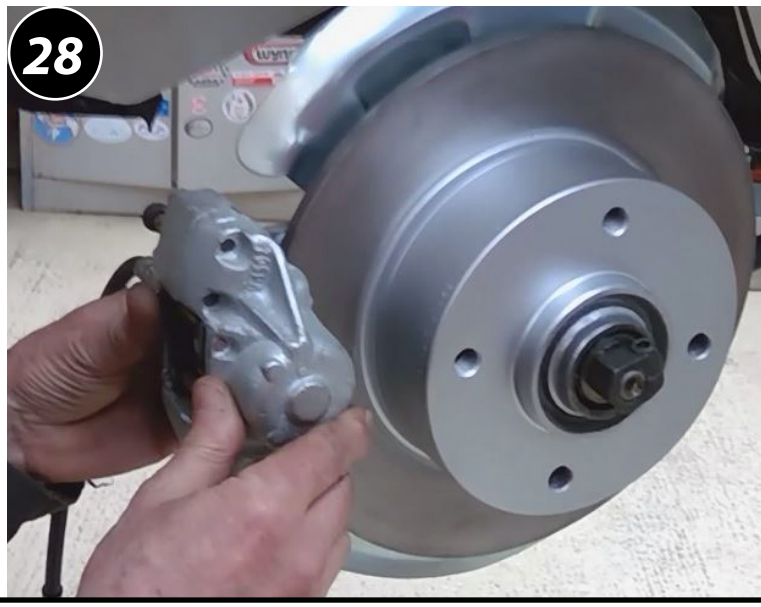
Put the track rod back in place (25), use a new locknut which you tighten with a torque of 30 Nm.

#51 Front axle

Fasten the anchor plate bolts (26) with a torque of 10 Nm, grease the wheel axle.

Mount the brake disc (27) and the caliper (28). If you have disassembled the brake lines, you must now reconnect them and fasten them with the necessary washers and finally bleed the brake circuit.

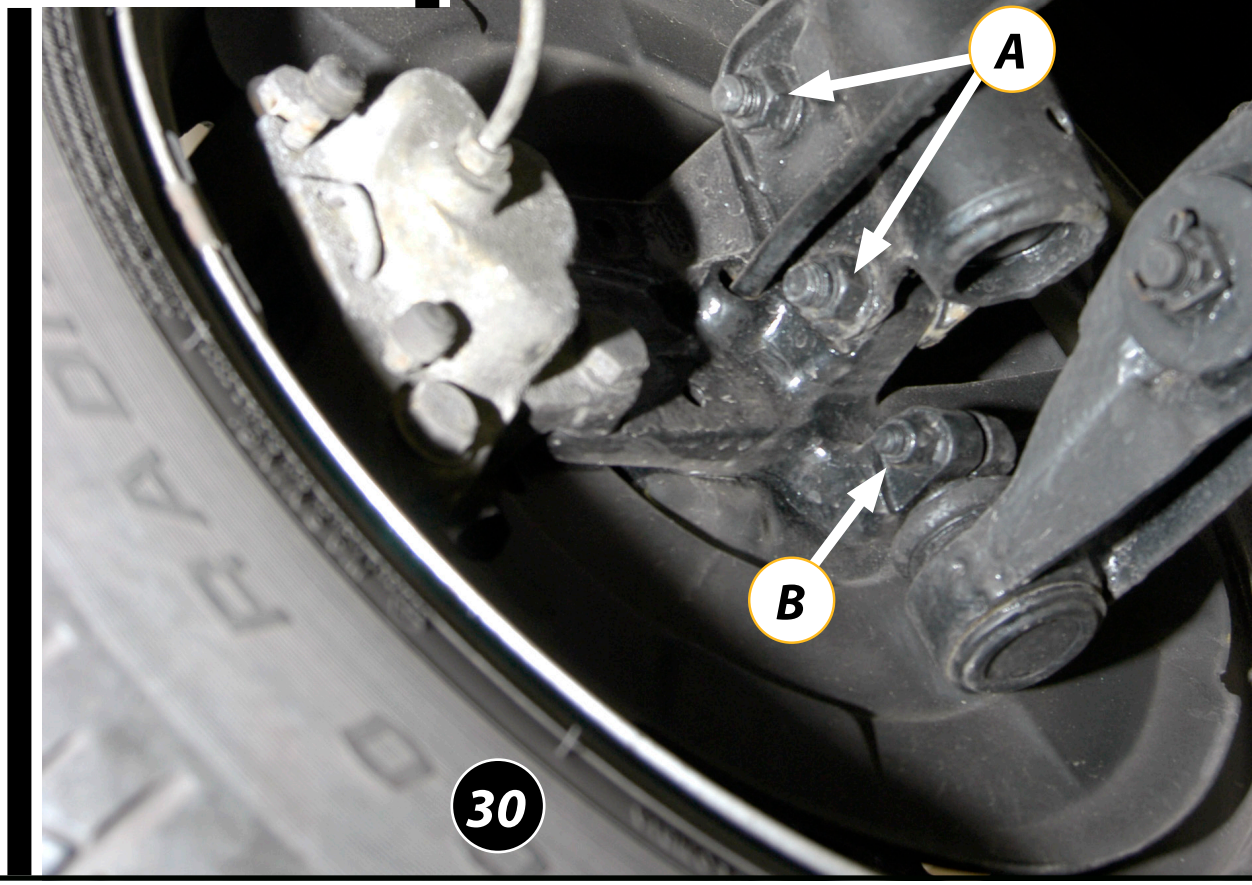
Attach the nut of the spindle (29) and its locking bolt (Allen). Because we have removed the spindle and strut as a whole, we now have to adjust the wheel play again. How to do this is explained in the next edition of this series.



removing the MacPherson

For the sake of completeness we show on the right the strut of the 2nd generation. This type of strut is attached differently to the spindle to improve the control of the car in case of a flat tire, no locking plates are used.

The two bolts (A) are tightened with a torque of 85 Nm. The locknut (B) of the track rod is tightened with a torque of 35 Nm.



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