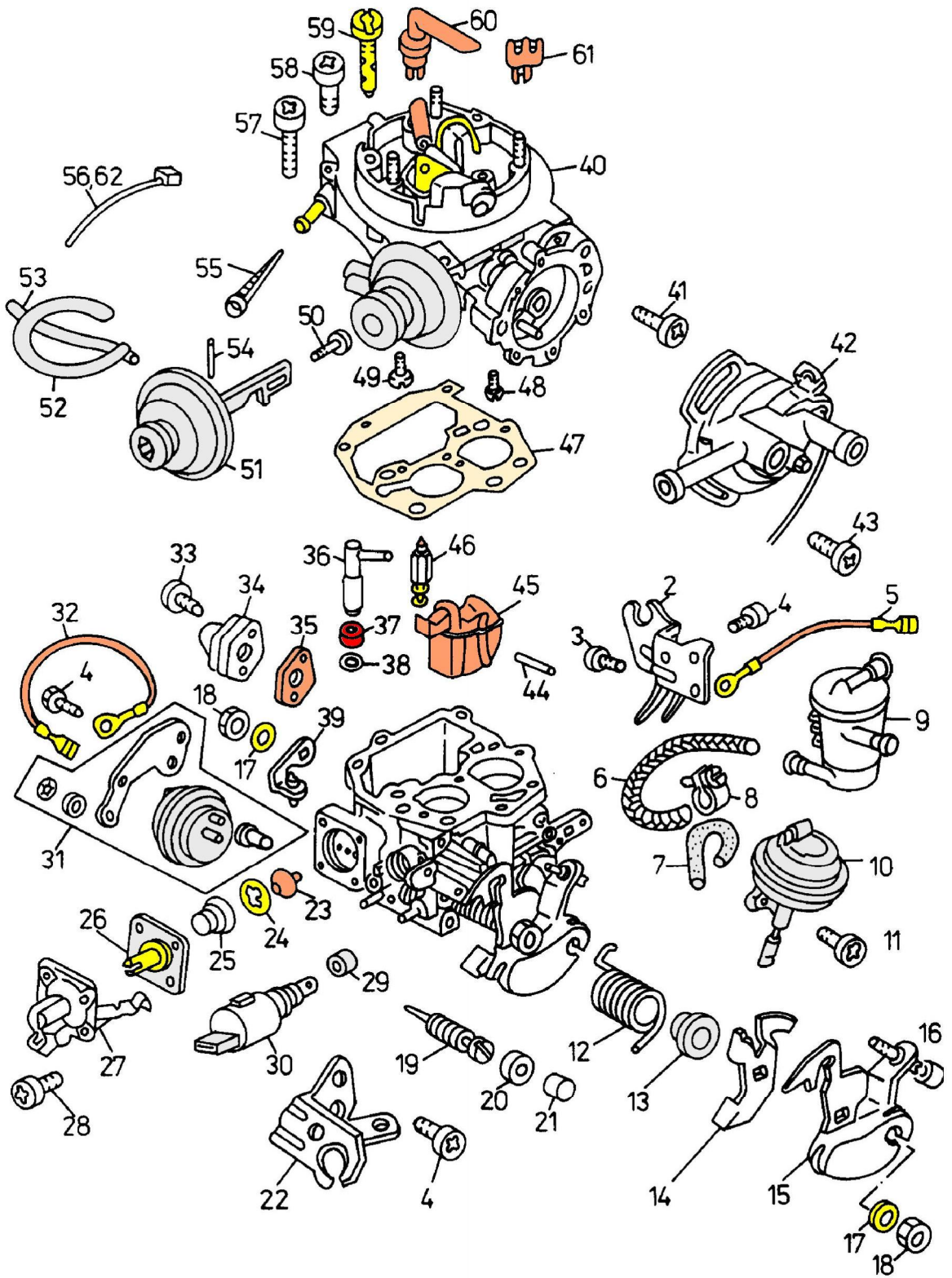


# PIERBURG

Carburettor: 2E3



Pos.	Part Number	Description	Remark	Qty.
2	115 940 384	bracket		1
3	115 940 662	oval head panel screw	4X8	2
4	115 940 653	cheese head with bolt washer	M5X12	7
5	115 940 792	earth line		
6	115 940 970	fuel hose	6/10X310	
7	115 940 972	hose	3,5/7,5X100	
8	115 940 761	clamp		
9	115 940 153	vapour eliminator		
10	115 940 250	vacuum unit	2nd stage	
11	115 940 654	cheese head with bolt washer	M5X16	
12	115 940 470	torsion spring		
13	115 940 160	bush for return spring		
14	115 940 302	throttle lever	1st stage	
15	115 940 304	throttle lever		
16	115 940 194	cap for screw		
17	992 746 488	lock washer	8,4mm	
18	100 940 710	hexagon nut	M8	
19	115 940 611	mixture control screw with:	M11 594 080 0	
20	115 940 800	O-ring		
21	115 940 630	bungs		
22	115 940 382	bracket for accelerator cable		
23	115 940 450	suction valve		
24	115 940 720	washer		
25	115 940 471	conical spring		
26	115 940 510	diaphragm		
27	115 940 192	pump cover		
28	115 940 650	cheese head with bolt washer	M4X14	4
29	115 940 802	O-ring		1
30	115 940 155	idling cut-off valve with:	M11 594 080 2	1
31	115 940 443	thermo valve		1
32	115 940 793	earth line		1
33	115 940 652	fillister head bolt (combi.)	M4X18	2
34	115 940 442	part throttle enrichment valve		1
35	115 940 991	seal		1
36	115 940 351	injector tube with:	M11 594 050 2 M11 594 080 1	1 1
37	115 940 502	strainer		1
38	115 940 801	O-ring	5mm	1
39	115 940 303	stop lever		1
40	115 940 182	carburettor body, upper part (POS.44-46,48-51,54,55,59-61)		1
41	115 940 655	cheese head with bolt washer	M5X18	3
42	115 940 196	cover with spring and heater element		1
43	115 940 651	cheese head with bolt washer	M4X16	3
44	115 940 220	axle		
45	115 940 201	float		
46	115 940 451	float needle		
47	115 940 990	seal		
48	115 951 004	main jet	2nd stage	
49	115 951 003	main jet	1st stage	
50	115 940 663	fillister hd. bolt	M3X16	
51	115 940 421	pull-down socket	M11 594 066 3	
52	115 940 971	hose	3,5/7,5X140	
53	115 940 973	hose	3,5/7,5X120	
54	115 940 670	parallel grooved dowel pin		
55	115 940 500	strainer		1
56	115 940 762	cable ties		1
57	115 940 661	cheese head with bolt washer	M5X35	2
58	115 940 660	cheese head with bolt washer	M5X25	2
59	115 940 431	emulsion tube		1
60	115 940 530	breather line		1
61	115 940 501	strainer		1
62	N 020 902 2	cable ties	3,6X246	1

## CONTENTS

Maintenance .....	2
Repair .....	2
Note .....	2
<b>A. SETTINGS: carburettor mounted .....</b>	<b>3-7</b>
1. Idle correction .....	3
2. Idle cut off valve .....	3
3. Starting device .....	3
3.1 Fast idle .....	3
3.2 Check pull-down device as to leakage .....	4
3.3 Thermo-time valve (TTV) .....	4
3.4 Compulsory opening of starter flap .....	4
3.5 Choke plate gap .....	5
3.6 Starter cover position .....	5
4. Stage II diaphragm unit .....	6
5. Filter in the fuel inlet .....	6
6. Gas linkage .....	6
7. Intake air preheating .....	6
8. Connection diagram, vacuum hoses .....	7
<b>B. SETTINGS: carburettor removed .....</b>	<b>8-10</b>
1. Setting of stage II throttle valve .....	8
2. Position of cam .....	8
3. Cold starting device, throttle plate gap .....	8
4. Accelerator pump .....	9
4.1 Direction of injection spray .....	9
4.2 Injection volume .....	9
5. Release and positive closing of stage II .....	9
6. Second stage pull rod .....	10
7. Float / float level .....	10
<b>C. Troubleshooting table .....</b>	<b>11</b>

### Maintenance

When necessary, check idle setting and correct, if required. If a setting as specified is not possible or in case of a complaint, check the carburettor according to **Chapter C: Troubleshooting table**. If necessary, remove and repair.

Note: After washing the engine, apply corrosion inhibitor onto carburettor, e.g. by spraying on WD40 or Uni-spray Termal.

### Repair

Remove carburettor, clean externally and disassemble. Clean castings and steel parts in special cleaning bath and rewash with test fuel DIN 51 632. Prior to cleaning remove filter in the fuel inlet, see chapter A.5. Blow out drillings and channels by means of compressed air. Use a repair kit available through the carburettor service outlets for the assembly of the carburettor. Make sure that all moving parts move freely.

Tightening torque for carburettor fixing screws: 7Nm.

### Note:

Screws protected by means of tamper-proof caps or protective lacquer may not be adjusted. In case these screws have, nevertheless, been tampered with, perform the setting according to the corresponding chapters. After completion of the setting replace the protections.

## A. SETTINGS, carburettor mounted

### 1. Idle correction

Idle rpm:  $800 \pm 50$ /min.

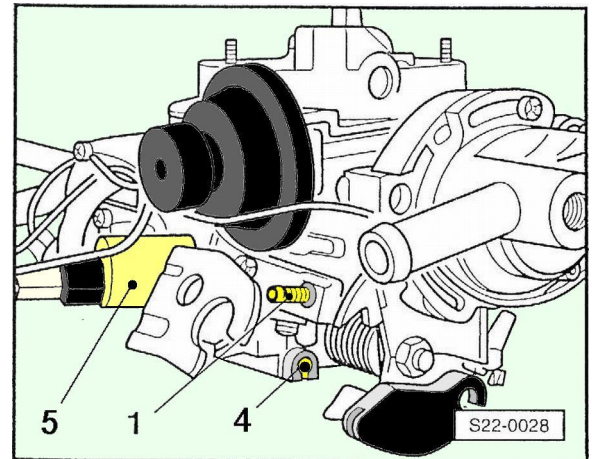
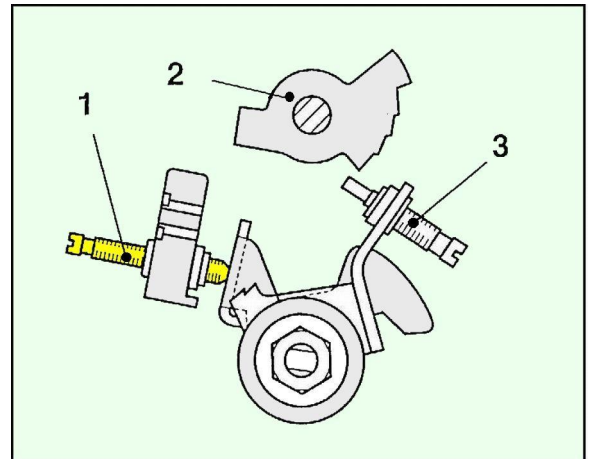
Idle emission value:  $1.0 \pm 0.5$  % CO

Conditions:

- flawless functioning of the engine
- oil temperature minimum  $60^{\circ}$  C
- ignition system in good working order
- intake system without leakages
- clean air cleaner mounted
- intake air preheating in good working order
- gas linkage as specified
- electric consumers cut off
- hose for the crankcase ventilation withdrawn and closed to the air cleaner
- engine speed counter and CO-tester connected
- the adjusting screw (3) must not touch the cam (2)
- starter choke not operating

Adjust idle speed by means of throttle plate screw (1).  
Only then we can correct emission value by means of the mixture control screw (4).

Remark: If this setting is not possible, see chapter "C. Troubleshooting table".



### 2. Idle cut off valve

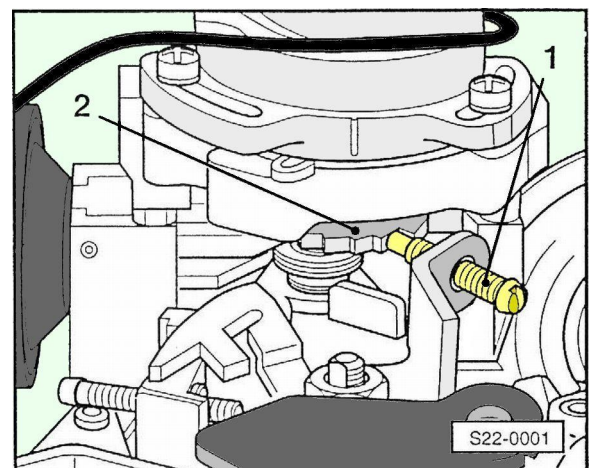
- Install and remove idle cut off valve (5) only with special tool MP 1-508.

### 3. Starter device

#### 3.1 Fast idle

Conditions: engine at normal operating temperature, idle correctly set

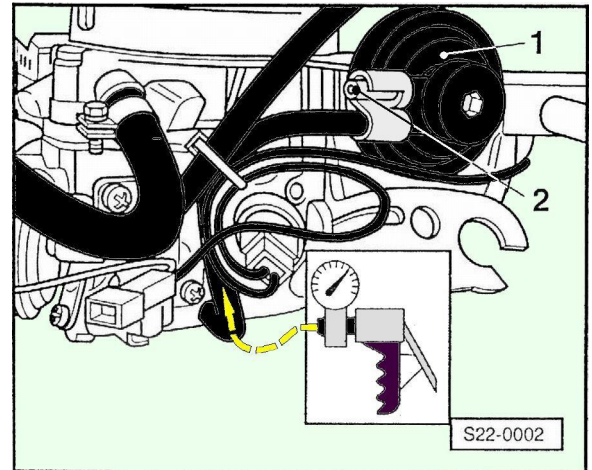
- Set adjusting screw (1) on the second step of cam (2).
- Start engine without depressing the accelerator pedal.
- Correct the fast idle to  $2300 \pm 100$  rpm with fully opened choke plate by means of adjusting screw (1).





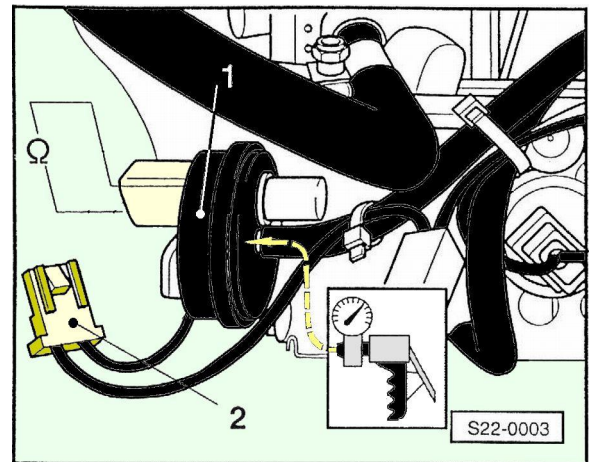
### 3.2 Check pull-down device (1) as to leakage

- Connect manual vacuum pump as shown and produce a pressure differential of approx. 300 mbar.
- Seal opening (2) with a finger.
- In case of a pressure drop remove leakages.



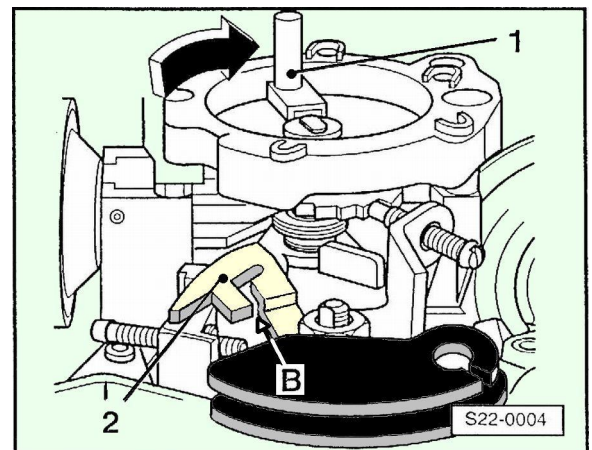
### 3.3 Thermo-time valve (TTV)

- Heat TTV (1) to about +20°C
- Connect ohmmeter in place of the connector (2)  
Nominal resistance: 1.9 – 2.6 Ω
- Cool down TTV to 0°C (air spray or refrigerator)
- Connect vacuum pump and operate pump. TTV must be open.
- Switch on ignition. Plug in connector (2) at TTV (1) and continue operating vacuum pump until the switchover time is determined (rise in pressure difference) Switchover time at 0°C is 1.5 – 5.5 seconds.
- Replace TTV if necessary.

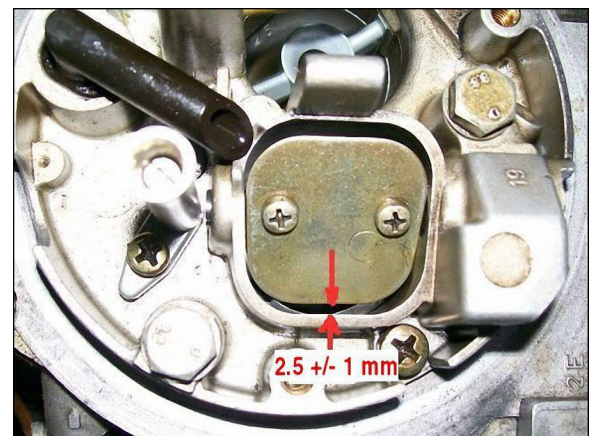


### 3.4 Compulsory opening of starter flap

- Press follower lever (1) slightly in direction of arrow and hold; use a rubber ring if necessary.
- Set throttle lever to full throttle position.



- Check the opening of the starter flap ( $2.5 \pm 1$  mm);
- Opening too small: increase size of gap "B" of segment (2) with a screwdriver.
- Opening too large: reduce size of gap "B" of segment (2) with pointed pliers.

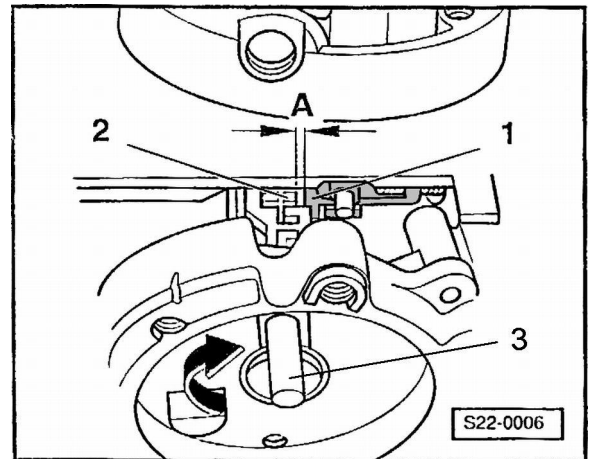


### 3.5 Choke plate gap

Conditions: pull-down device without leakages, starter cover removed, and starter flap is fully closed.

#### Gap "A"

- Raise throttle valve, press follower lever (3) in direction of arrow and release throttle valve. Fast idle adjusting screw is positioned on highest step of cam.
- Check gap "A" (0.5 – 1 mm)
- Set play by bending the lever (2).

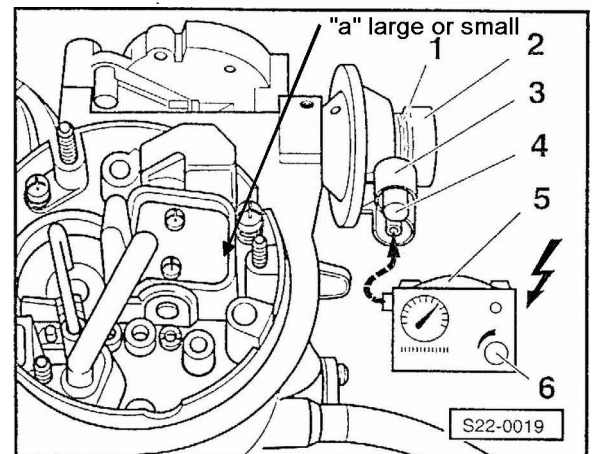


#### Gap "a" small

- Connect vacuum pump as shown (but without cap 4) and produce a pressure differential of 110 mbar.
- Push follower lever (3) slightly in direction of arrow and check gap of starter flap.

$$\text{"a" small} = 0.8 \pm 0.2 \text{ mm}$$

- Set the correct size of gap by turning screwed cap (1).

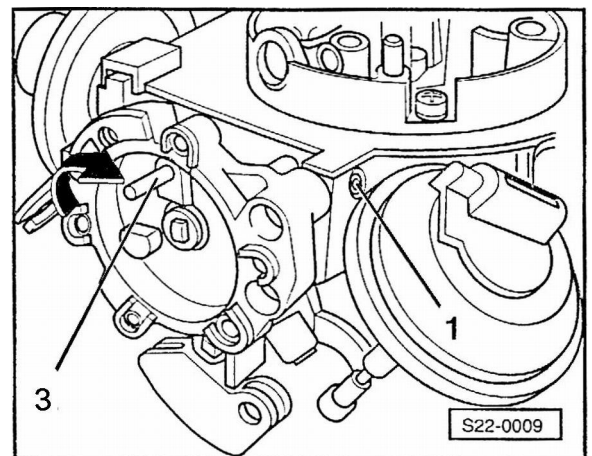


#### Gap "a" large

- Place cap (4) and produce a pressure differential of 200 mbar.
- Push follower lever (3) slightly in direction of arrow and check gap of starter flap.

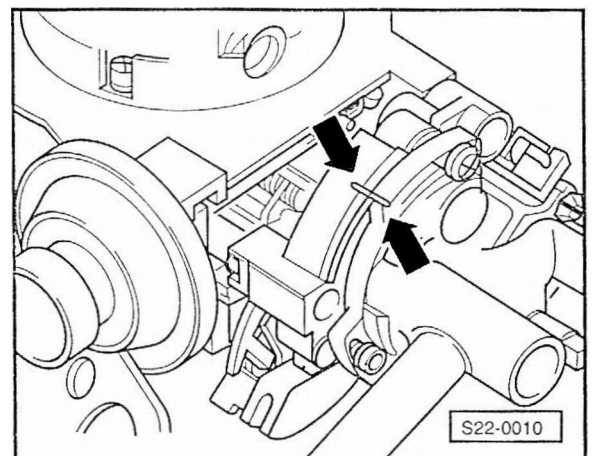
$$\text{"a" large} = 2.0 \pm 0.2 \text{ mm}$$

- Correction by means of adjusting Allen screw (1).



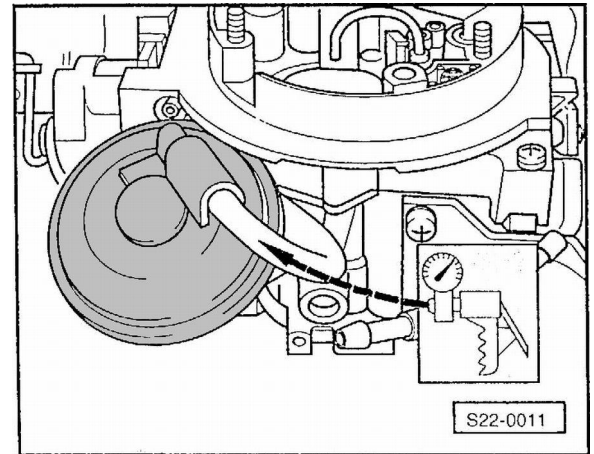
### 3.6 Starter cover position

- The markings (arrows) must be in line.



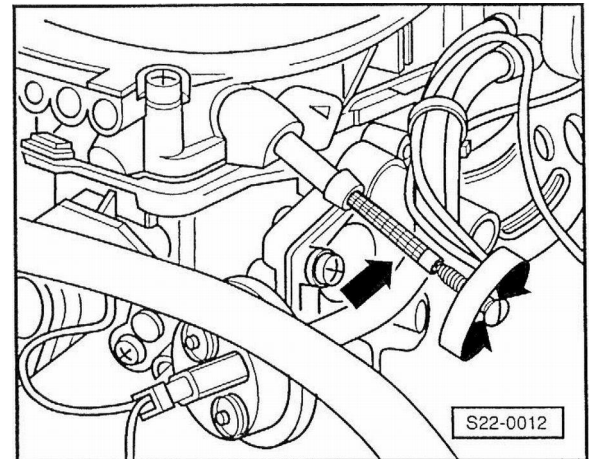
#### 4. Stage II diaphragm unit

- Connect manual vacuum pump as shown in the illustration and produce a pressure differential.
- In case of a pressure differential drop, the vacuum hose or the diaphragm unit is defective.
- If necessary replace.



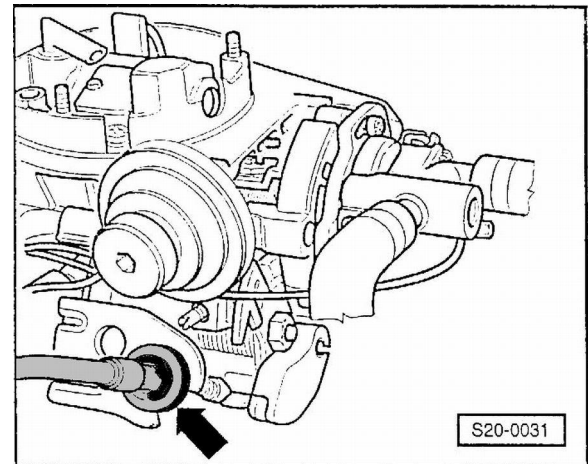
#### 5. Filter in the fuel inlet

- Prior to cleaning the carburettor remove the filter (arrows).
- The filter may be withdrawn by means of a screw M3 screwed in approx. 5 mm. Always replace filter.



#### 6. Gas linkage

- Depress accelerator pedal to the full load position. Check full throttle position at the throttle valve lever. Full throttle position must just be reached (clearance maximum 1mm).
- Adjust gas cable by re-positioning the locking device (arrow) at the supporting bracket.

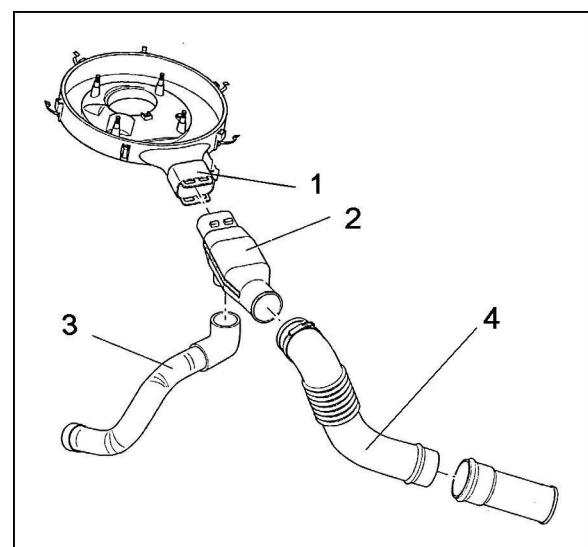


#### 7. Intake air preheating

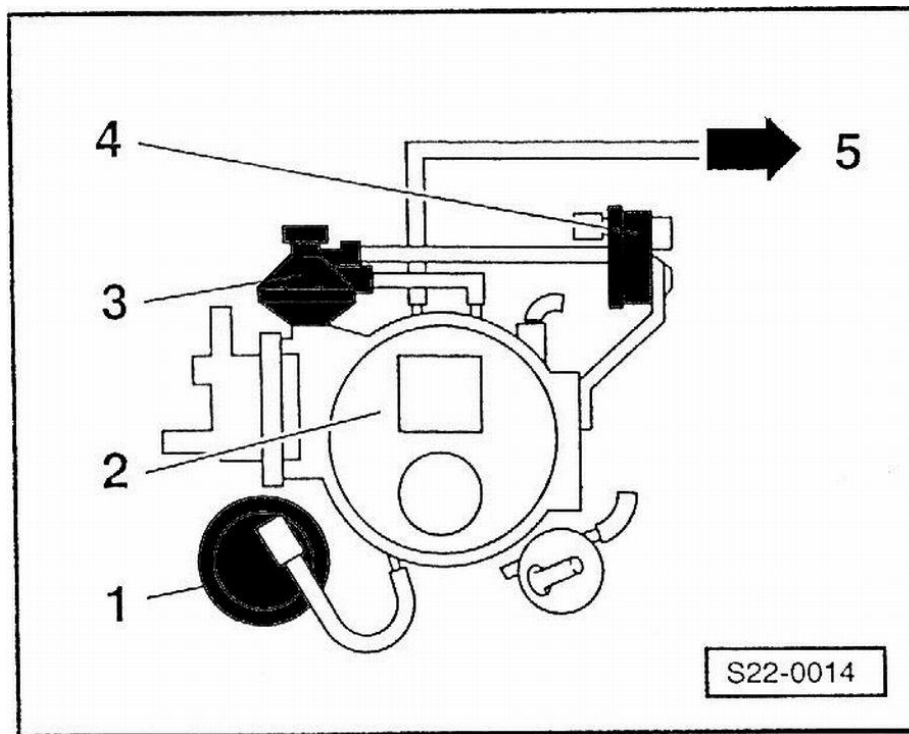
- Intake air preheating is regulated by an air flap and a spring (inside 2) which is operated by an expansion element (inside 1).
- When the engine is cold (less than about 15°C), the air flap must seal off the cold air port completely allowing warm air to come from the exhaust shield through flexible pipe (3).

- Cool down with refrigerant spray.

When the engine is warm, the warm air port must be closed and so cold air can come from pipe (4). If this position is not reached, the fault is at the expansion element.



8. Connection diagram, vacuum hoses



1 stage II diaphragm unit  
2 carburettor  
3 vacuum pull-down

4 thermo-time valve  
5 pipe to brake servo

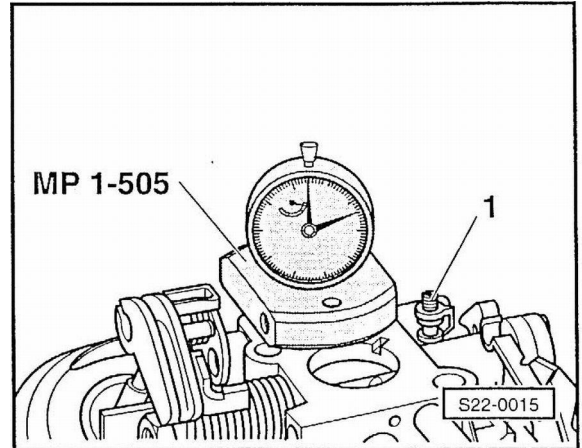


## B. SETTINGS, carburettor removed

Below mentioned measuring and test devices may be purchased from the local general agent.

### 1. Setting of stage II throttle valve

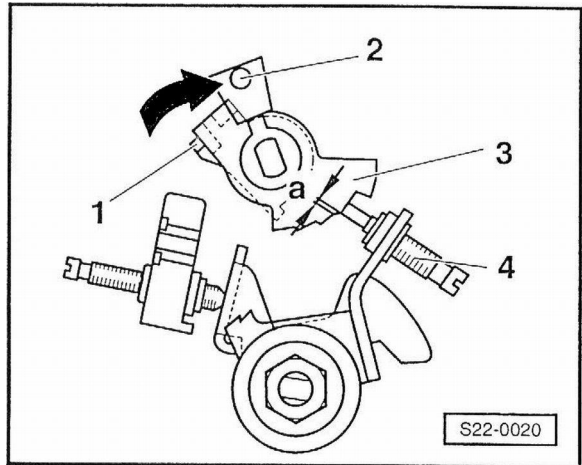
- Slacken throttle valve stop screw (1) sufficiently so that it is no longer making contact.
- Fit on measuring device MP 1-505 and set throttle valve stop screw to size  $0.08 \pm 0.02$  mm.



### 2. Position of the cam

Condition: choke plate gap already verified and set as specified.

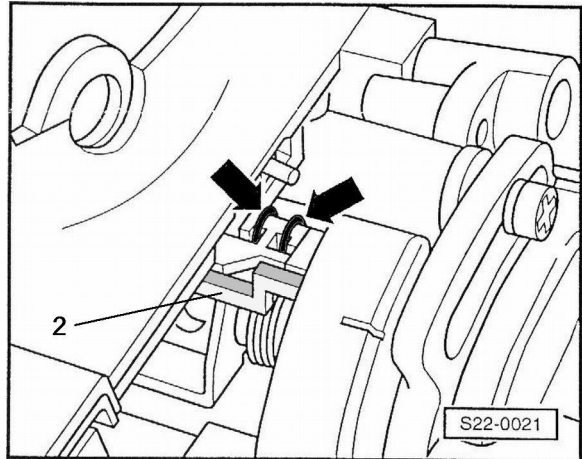
- Remove starter cover.
- Place adjusting screw (4) on highest step of cam (1).
- Produce pressure differential in the vacuum pull-down with pull-down upper connection sealed.
- Open throttle plate, push entrainment lever (2) lightly in direction of arrow and again close throttle plate. The adjusting screw (4) must rest in the distance "a" on the 2nd highest step of the cam (1).



$$"a" = 0 + 0.1 \text{ mm}$$

Correct size "a" by bending the lever (2).

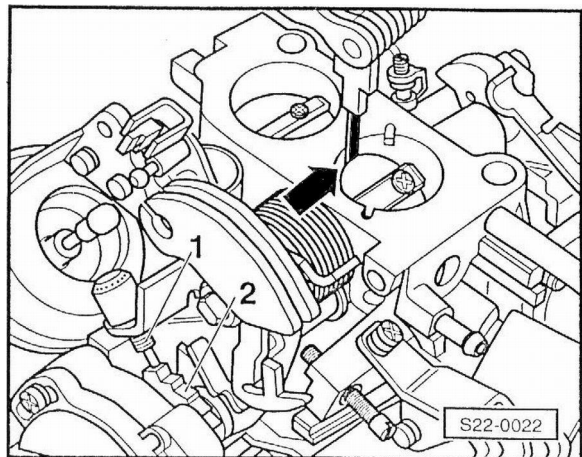
Important: Make sure that the return springs are in the correct position (see arrows).



### 3. Cold starting device, throttle plate gap

- Place adjusting screw (1) on the highest step of the cam (2).
- Measure throttle plate gap (arrow) and set to 1 mm by means of the adjusting screw (1).

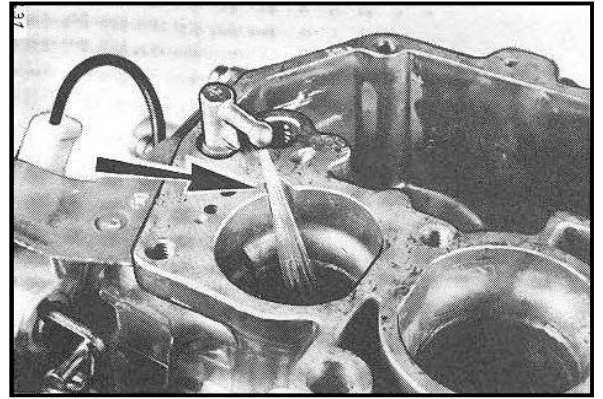
Remark: Check fast idle rpm after installation of the carburettor, if necessary correct, see chapter A.3.1.



#### 4. Accelerator pump

##### 4.1 Direction of the injection spray

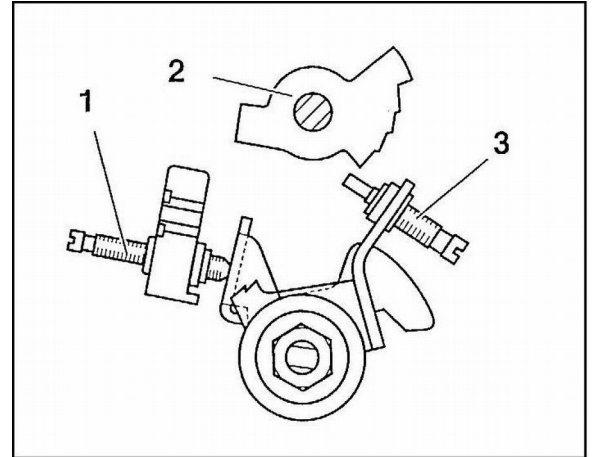
- Remove carburettor cover.
- Insert injector tube (by pressfitting) so that the fuel spray is in the direction of the recess (arrow).



##### 4.2 Injection volume

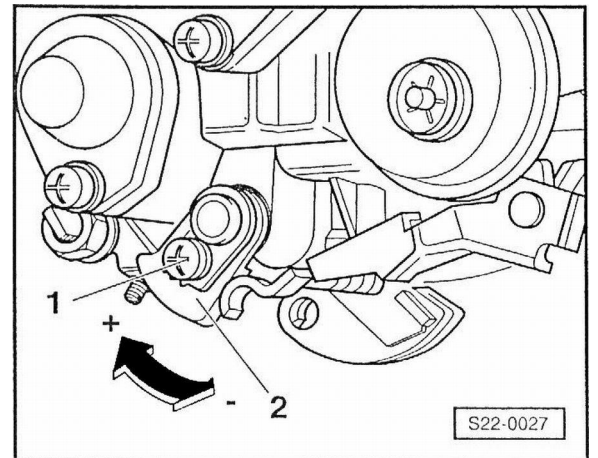
Conditions: during the measurement the float chamber must have normal level, i.e. fuel must flow in. Start of injection must occur immediately the throttle valve is operated.

- Use carburettor testing device.
- Close fuel return connection if provided.
- Turn cam (2) and hold so that the adjusting screw (3) no longer rests on it.
- Completely open and close uniformly throttle plate 10 times (approx. 1 s per stroke). Waiting time between strokes: approx. 3 seconds.



- Divide fuel quantity by 10 and compare with the nominal value ( $0.326 \pm 0.078 \text{ cm}^3$ ).
- Correct injection volume by loosening clamping screw (1) and turning cam (2).

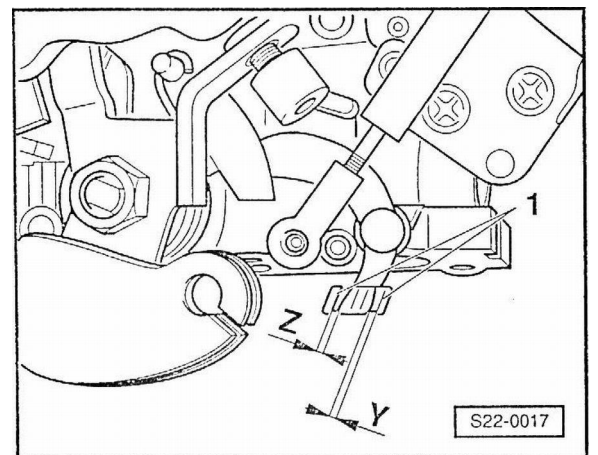
In direction + injection volume larger  
In direction - injection volume smaller



#### 5. Release and positive return of stage II

- Condition: Throttle plate stage I in idle position.
- Adjust distances "Y" and "Z" by bending the fork (1). Measure at the narrowest location.

Y (mm)	Z (mm)
$0,8 \pm 0,3$	$0,4 \pm 0,3$

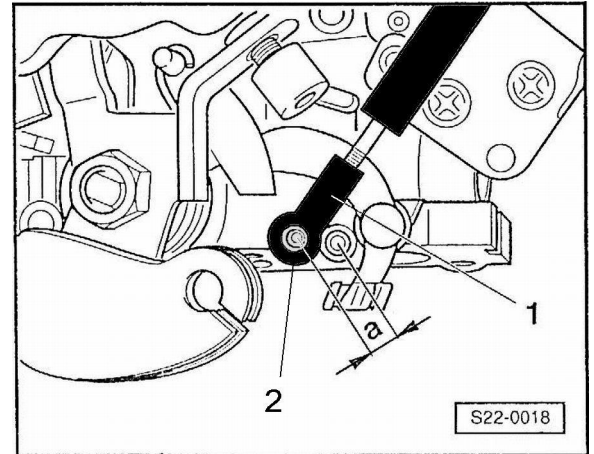


## 6. Second stage pull rod

- Detach ball joint (2) and check size “a” (pre-stress)

$$a = 0.5 - 2.0 \text{ mm}$$

- Correct size a by screwing or unscrewing pull rod (1).

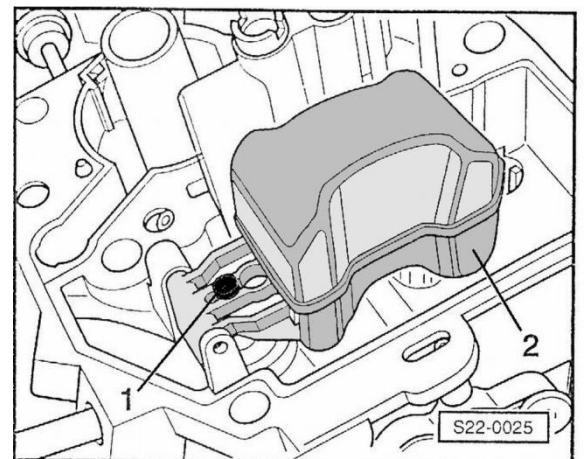


## 7. Float / Float level

- Take off top part of the carburettor.

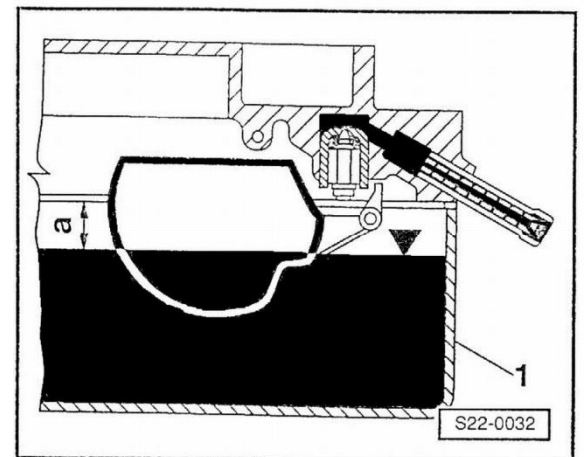
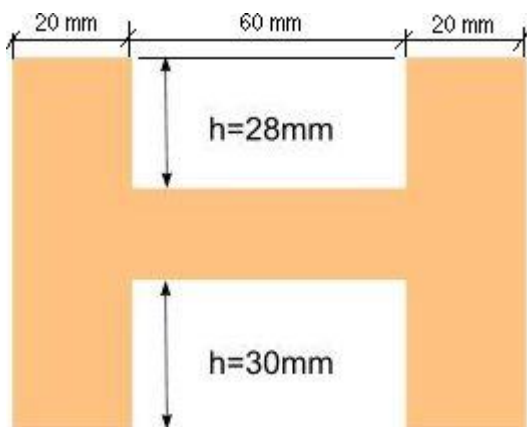
The float level is not adjustable. It will automatically result if an acceptable float is used. At the occasion of a general rework the float weight has to be checked.

- Check weight of float ( $5.85 \pm 0.1 \text{ g}$ )
- Replace if faulty.



$a = 9.5 \pm 1 \text{ mm}$  inside the float chamber (1).

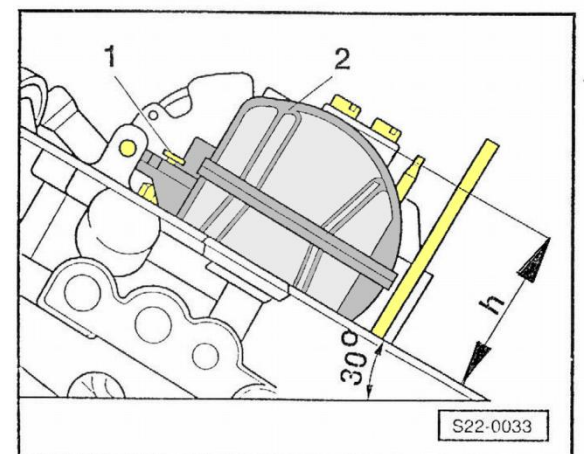
This is measured through one of the vents,



Conditions: without gasket on the cover and the float (2) must not press the valve pin (1) when measuring the height.

$$h = 29 \pm 1 \text{ mm}$$

This is measured using a template made of cardboard or aluminium in the shape of letter H.



## C. TROUBLESHOOTING TABLE

COMPLAINTS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Cold starting (firing)	•	•					•		•								•				•	
Stabilization of engine run (stalling after cold starting)		•	•	•			•										•					
Cold idle (rpm too high/ too low)		•			•	•	•	•		•	•						•					
Cold drive away, transition cold (response bad, bucking)		•	•	•	•			•		•	•		•				•					
Choke does not switch off completely or too late		•		•	•																	
Warm starting (starting time more than 5 seconds)									•			•			•	•	•					•
Idle (rough, too high, too low)										•	•			•	•		•					
Idle rpm or CO too high (not adjustable)						•					•			•			•					
Transition during acceleration (bucking)										•	•		•				•				•	
Transition at high rpm (to stage II)													•							•	•	
Exhaust detonations during deceleration										•	•						•				•	
Power (too small, misfiring at full load)														•		•		•	•	•		
Excessive fuel consumption		•			•					•	•			•	•	•				•	•	•
<b>Cause probability {high number = high probability}</b>	<b>1</b>	<b>6</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>6</b>	<b>7</b>	<b>1</b>	<b>3</b>	<b>4</b>	<b>3</b>	<b>3</b>	<b>9</b>	<b>1</b>	<b>2</b>	<b>5</b>	<b>2</b>	<b>1</b>

	CAUSE	REMEDY	CHAPTER
1	Choke plate does not completely close	Adjust choke device/check bimetal spring	A.3
2	Choke plate or linkage hard moving or jamming	Assure free movement	
3	Choke plate gap incorrect	Adjust	A.3.5
4	Pull-down device leaks or defective	Check, if necessary replace parts	A.3.2
5	Starter heating, intake manifold pre-heater and thermo-switch not working properly, cooling water flow disturbed	Check heating coil, thermo-switch and contact breaker points; check cooling water flow	A.3.3
6	Cam jams; wrong position; return springs defective	Assure free movement and reset respectively, if necessary replace carburettor cover	B.2
7	Cold starting device, throttle plate gap incorrect	Set fast idle and throttle plate gap respectively	A.3.1 & B.3
8	Bypass bi-metal coil heating defective	Check TTV element, if necessary replace	A.3.3
9	Idle cut off valve does not open	Check, if necessary replace	A.2
10	Idle setting incorrect	Correct	A.1
11	Idle fuel air jet clogged	Clean, if necessary replace	
12	Fuel evaporates (engine excessively rich)	Hold accelerator pedal in full load position and start; for a trial change fuel quality	
13	Injection volume	Check, if necessary set	B.4.2
14	Enrichment valve defective	Replace	
15	Float needle valve leaks	Clean valve, if necessary replace needle	
16	Float defective, level incorrect	Replace float	B.7
17	Erroneous air on gaskets, hoses or flange	Replace gaskets	
18	Throttle plates do not completely open	Correct gas linkage	A.6
19	Stage II diaphragm unit leaks	Replace	A.4
20	Jet setting not as specified	Replace jets	
21	Operating fault	Start according to instructions	
22	Operating conditions	Consumption measurement, explain to client	

### NOTE

Conditions for the application of this table are:

- good functioning of the engine (timing. valves, and so on)
- ignition system and its setting as specified
- intake system without leakages
- acceptable exhaust system
- correct control of the intake air preheating
- clean air filter
- correct fuel pressure to the carburettor



# 2E3 Carburetor

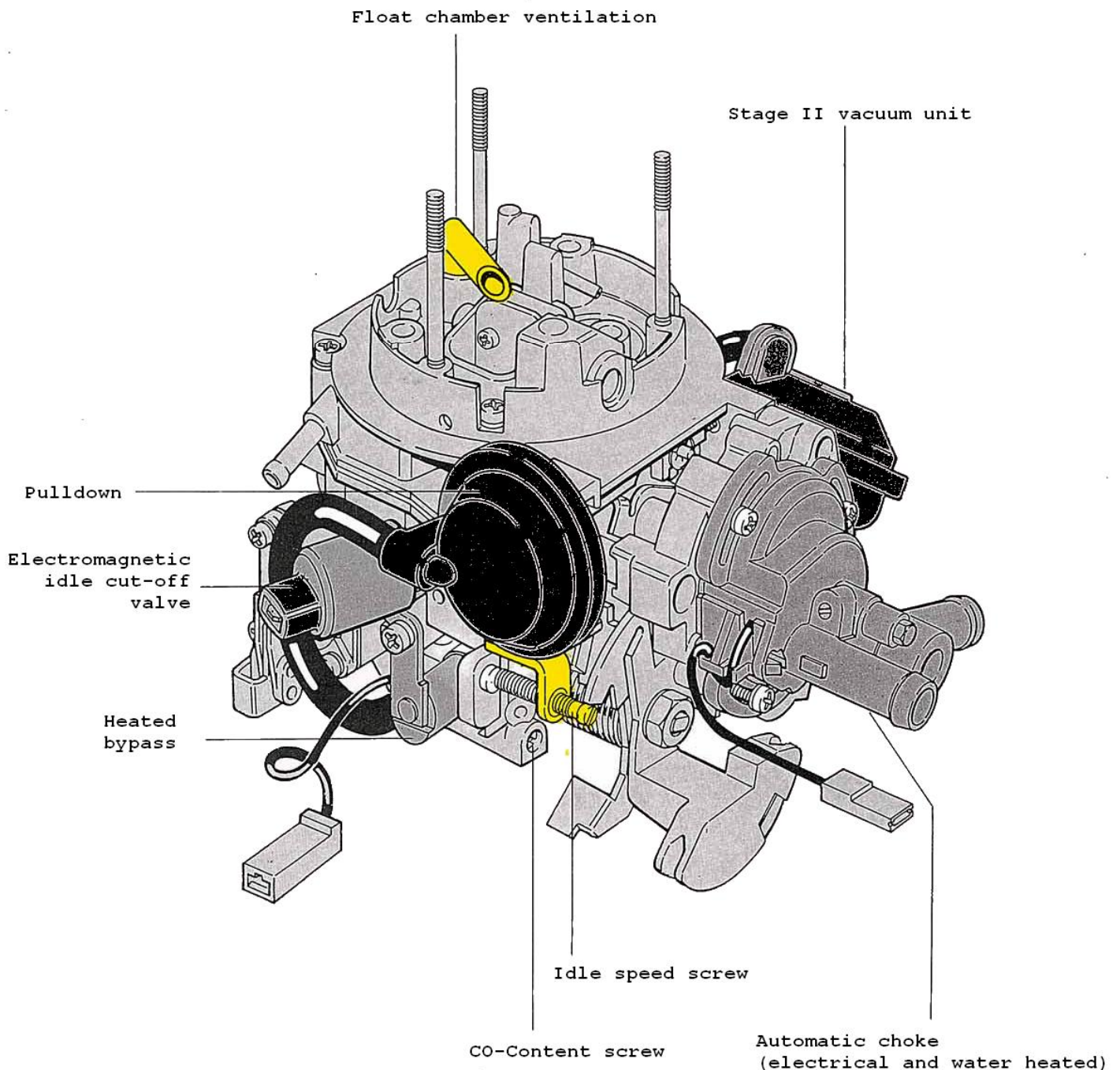
The 2E3 is a downdraft carburetor without any mixing air recirculation.

- Its automatic choke is heated electrically and by coolant.

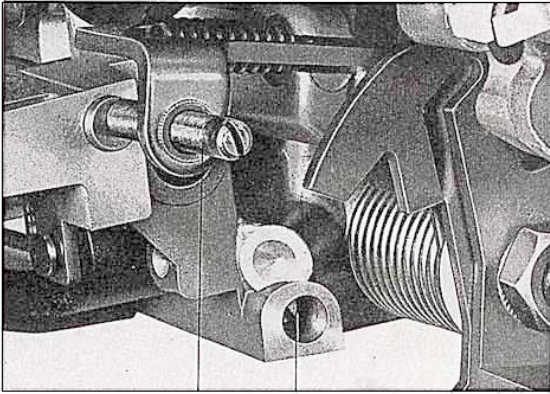
- For a better mixture preparation, the bypass for idle CO mixture is heated.

- The pull-down device regulates the choke flap position after a cold start.

- The electromagnetic cut-off valve prevents the engine from running after it is switched off.



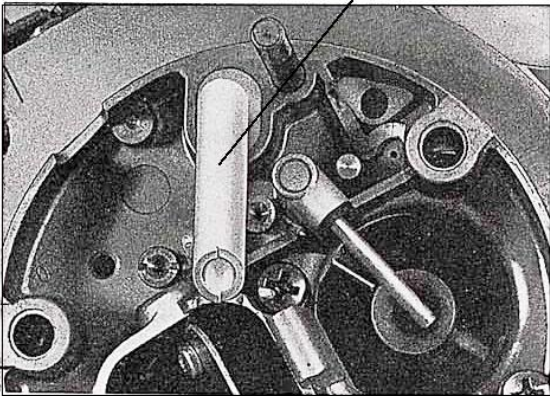




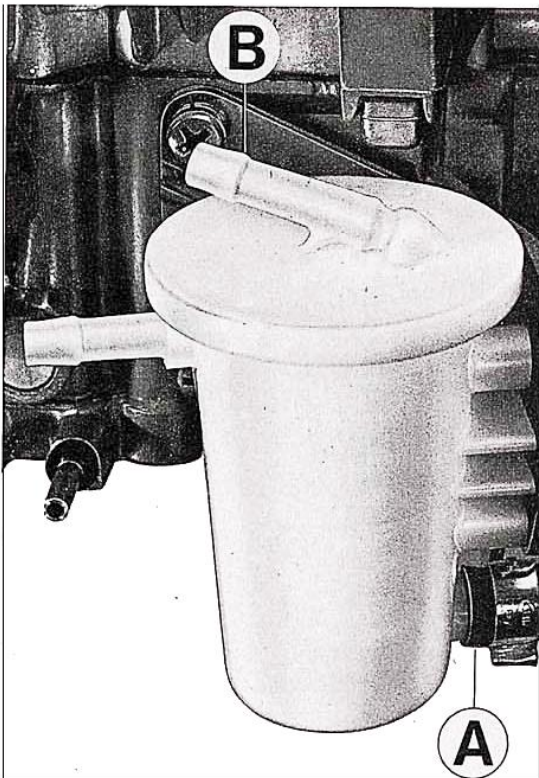
Idle speed      CO content

The idle speed and CO content can be adjusted by turning in and out the two adjustment screws.

Float chamber vent



The float chamber vent is calibrated by a plastic insert. Because the vent pipe is tapered, the pressure in down pipe and inside float chamber is lowered. The vent calibration allows a limited airflow. This will prevent fuel spilling from the float chamber.

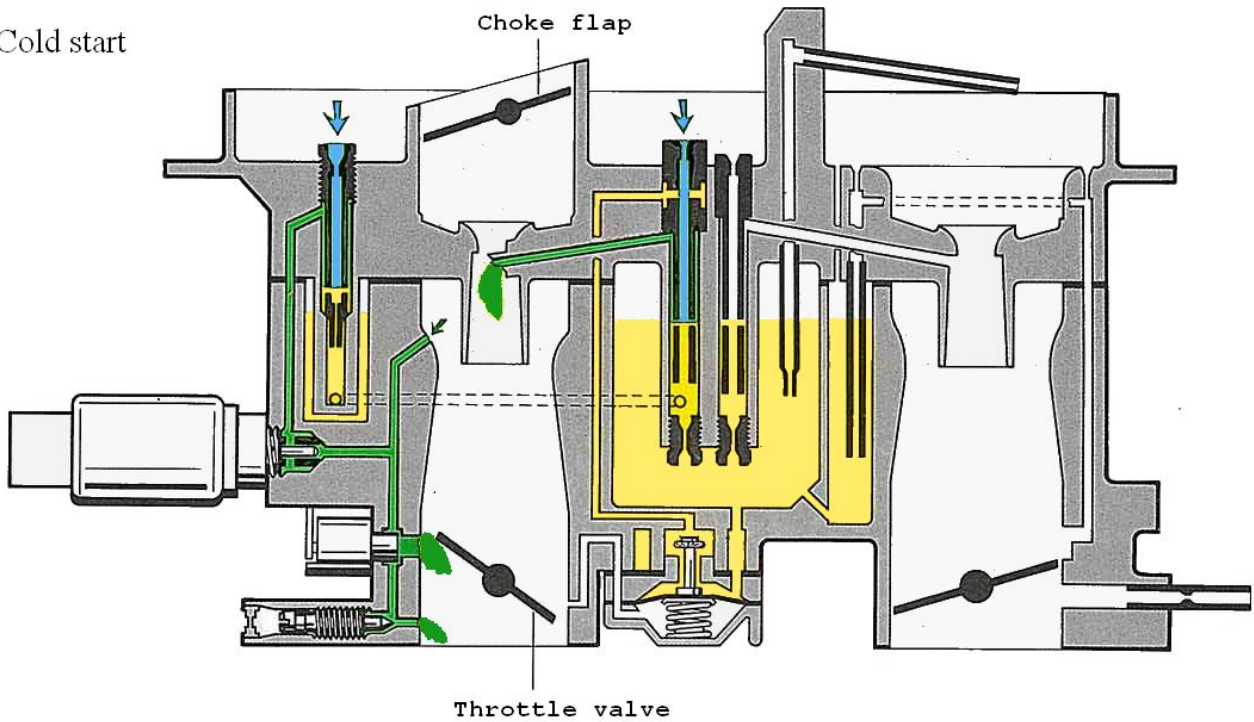


The vapor bubble trap prevents hot start difficulties.

Bubble-free fuel flows through outlet A to the carburetor. Vapor bubbles and excess fuel go through outlet B back to fuel tank.

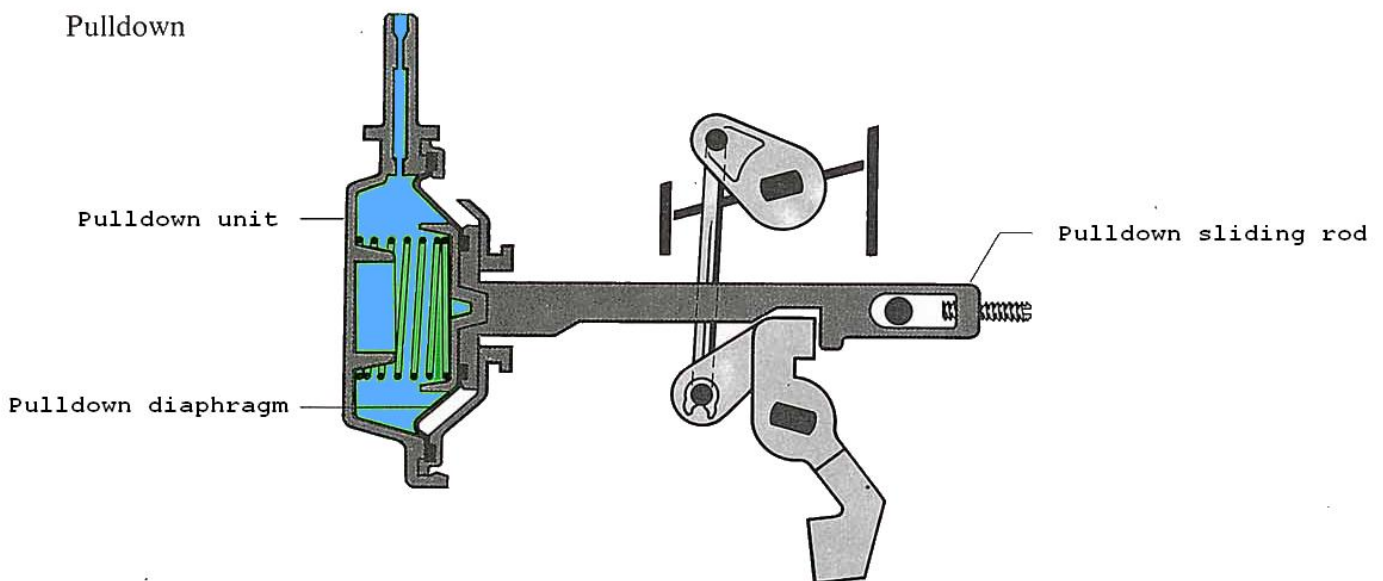
# 2E3 Carburetor Functions

Cold start

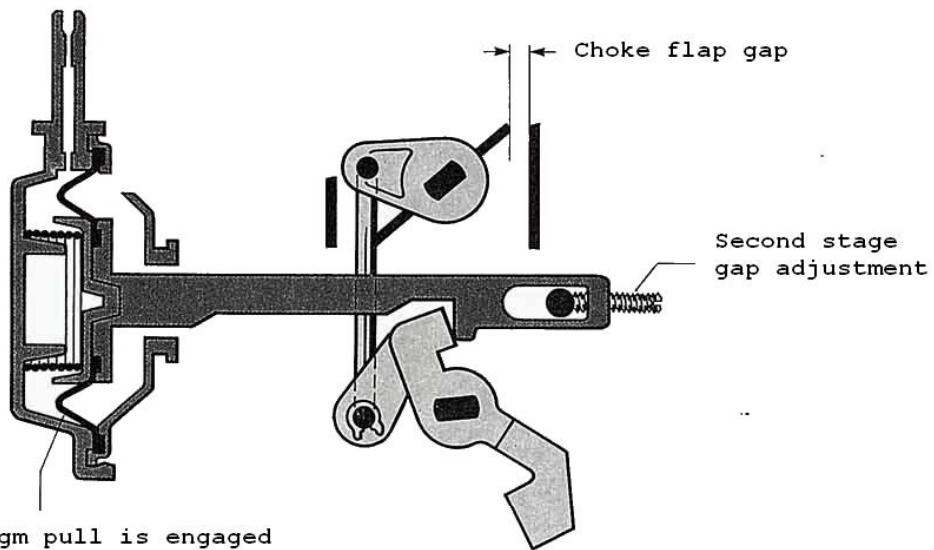


By pressing the accelerator pedal, the automatic starter control is primed. The bimetal spring in the starter control housing closes the choke flap depending on the ambient temperature. The stop screw rests on the step cam and keep the throttle plate open at a certain level. When cranking the engine, all fuel jets of stage I are exposed to low pressure in the manifold. Therefore the enriched mixture necessary for the cold start is obtained. Due to compression temperature, the low-boiling fractions from the fuel can be vaporized. In combination with air, a combustible mixture is formed. The engine starts.

Pulldown



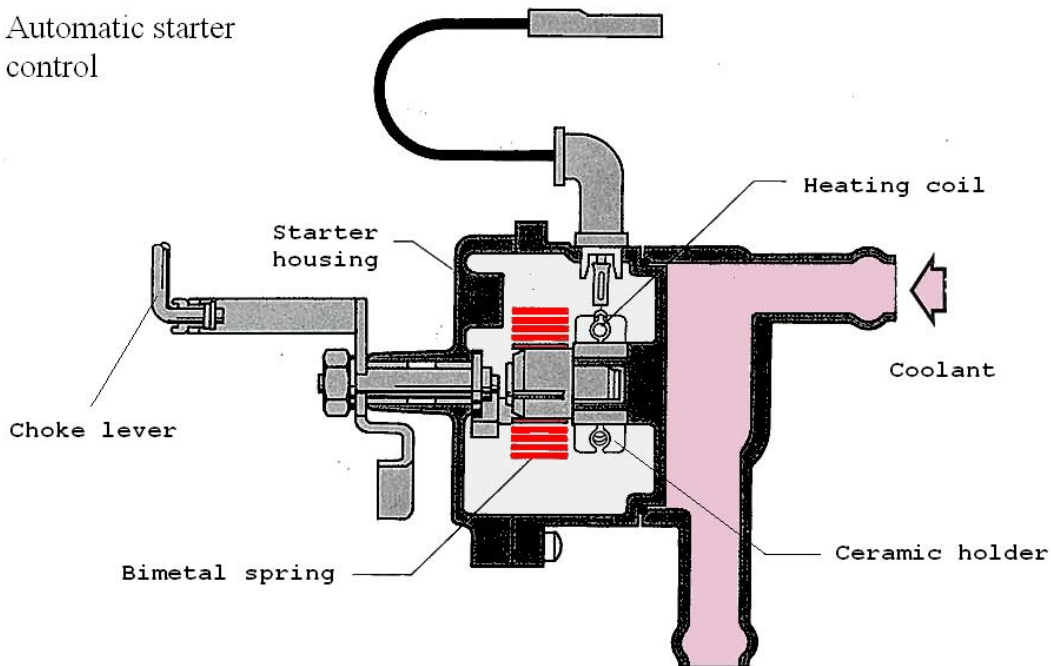
When cold starting, the choke flap is completely closed.



Diaphragm pull is engaged

In order to avoid an over-rich mixture, the choke flap can be opened by a specific amount. This is done through the pulldown device. Due to low pressure in the suction pipe, the choke flap is opened using the pull-diaphragm to an adjustable value to prevent over-enrichment.

#### Automatic starter control

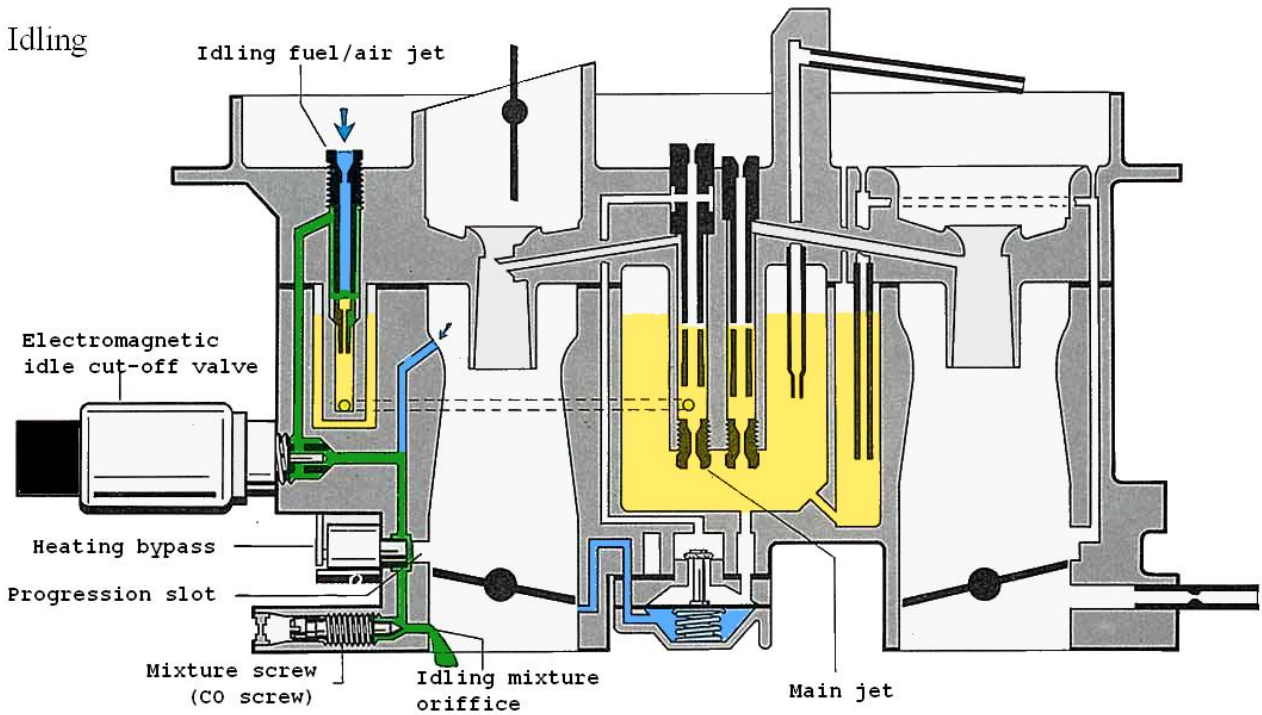


Due to electrical heating and by the increasing temperature of the coolant, the bimetal spring is beginning to unwind. The choke flap is gradually opened. The step cam rotates into its normal position and the throttle plate is gradually closed by the rapid idle stop screw. At a coolant temperature of 65° C, a temperature switch cuts the electrical heating of the mixture in the intake manifold.



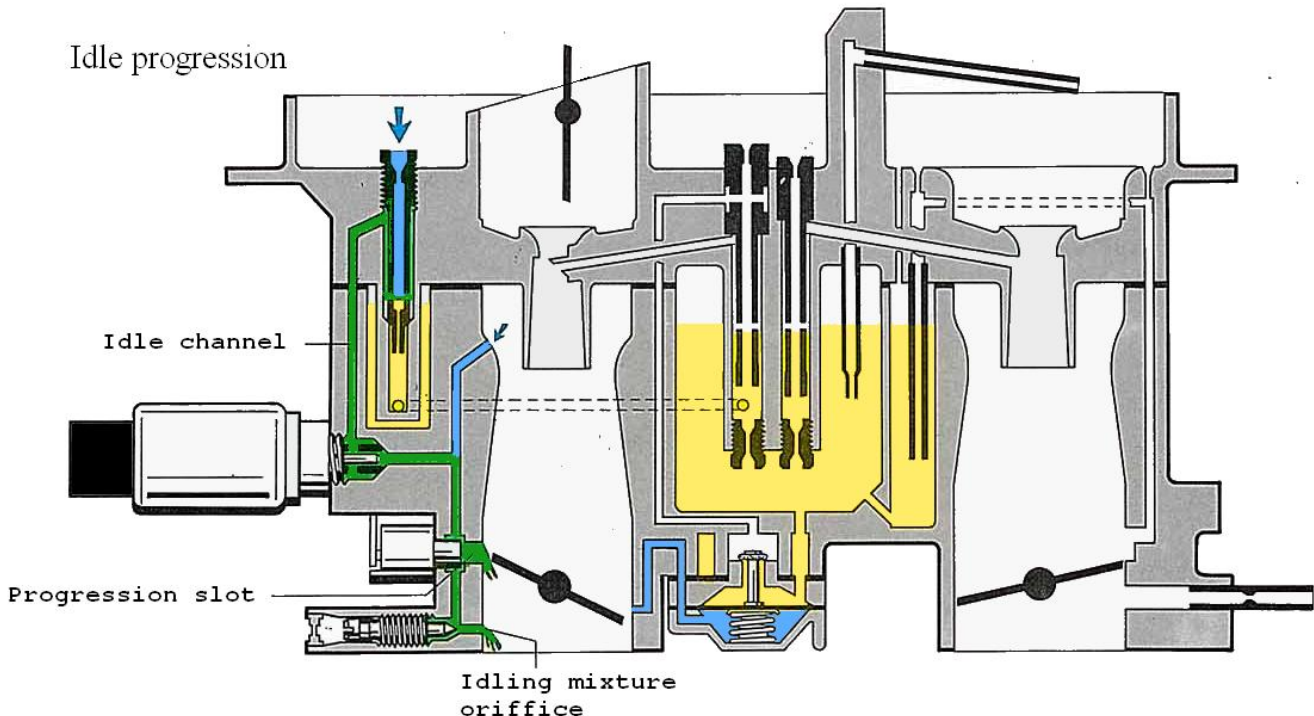
# 2E3 Carburetor Functions

Idling



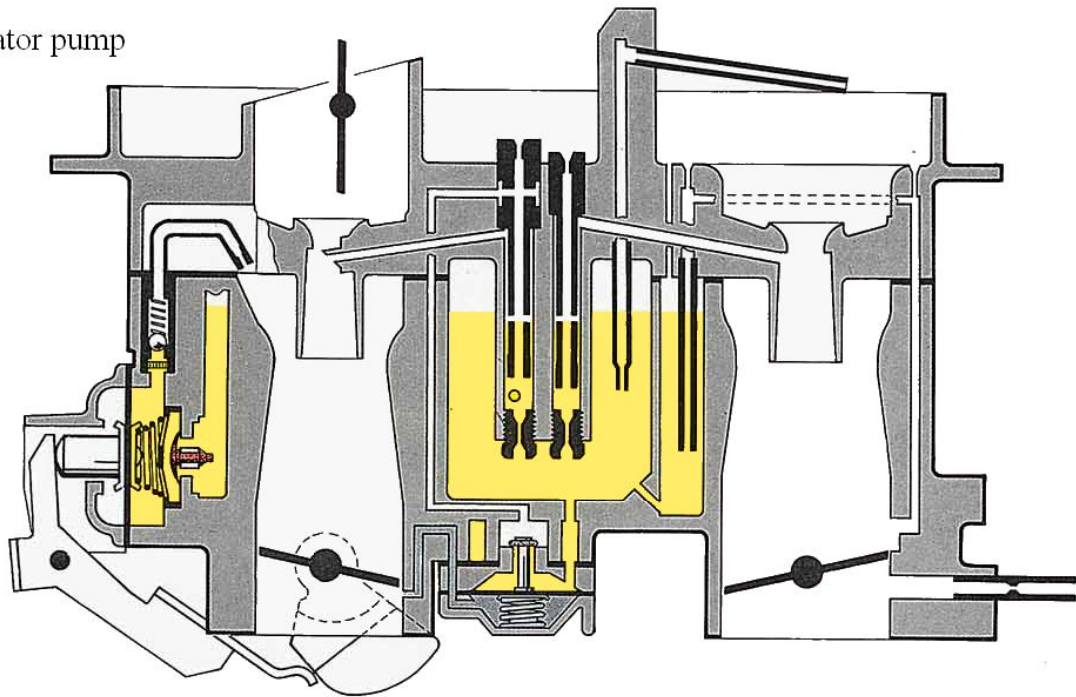
Throttle valve is almost closed at idle. The fuel is pre-calibrated by the main jet for stage I. The idling fuel/air jet reaches to the idling orifice through idle cut-off valve. At this time more air is added through a slot to form the idle mixture. The mixture ratio can be adjusted with the CO-adjusting screw. The electrical heated bypass prevents carburetor from icing in bad weather.

Idle progression

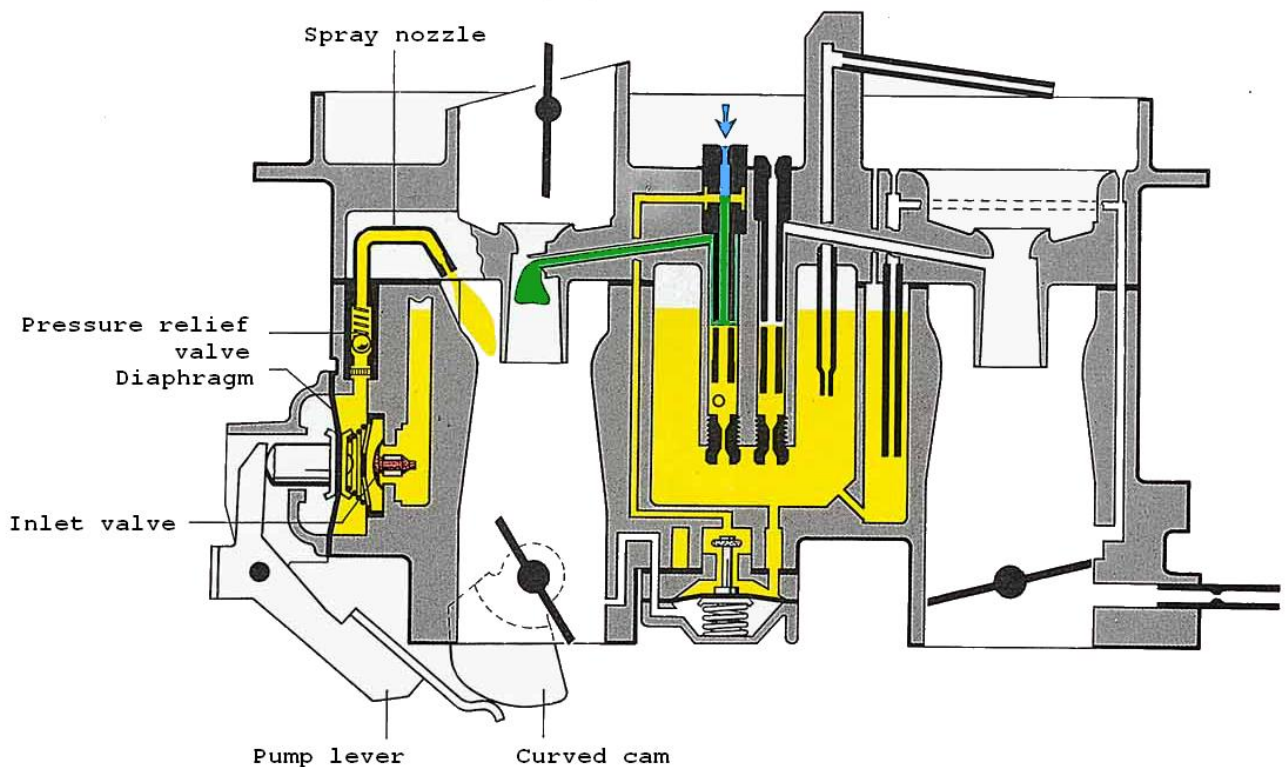


To achieve a perfect transition from idle to part throttle stage, more holes are drilled above the idling orifice in the progression slot area. If more gas is given, those orifices are exposed to the vacuum under the throttle valve, and additional mixture flows from the progression slot into the idle mixing chamber.

## Accelerator pump



When throttle valve pivots in the idle position, the diaphragm is pushed outwards by the spring. The fuel flows into the pump chamber.

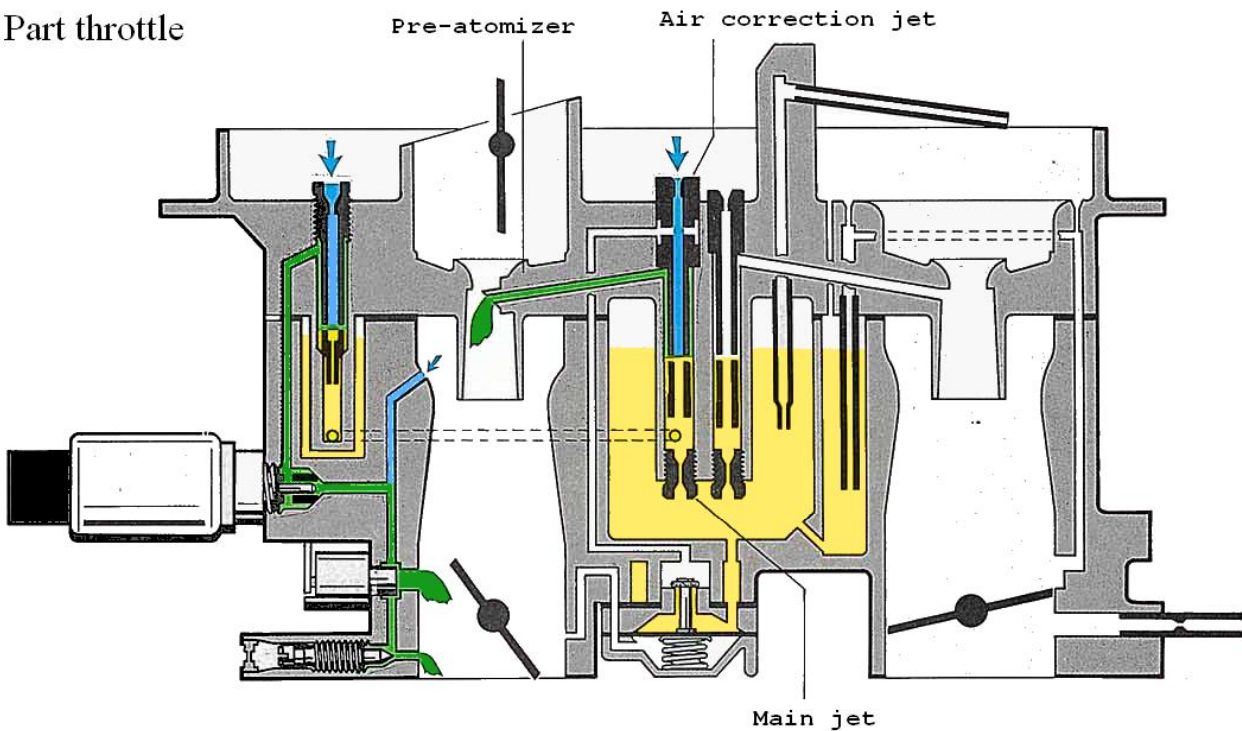


During acceleration, the pump lever is actuated by the cam on the throttle valve shaft and a pressure is exerted on the diaphragm. The inlet valve closes, the pressure valve opens the way to the injection tube. The quantity of fuel injected can be adjusted by rotating the cam.



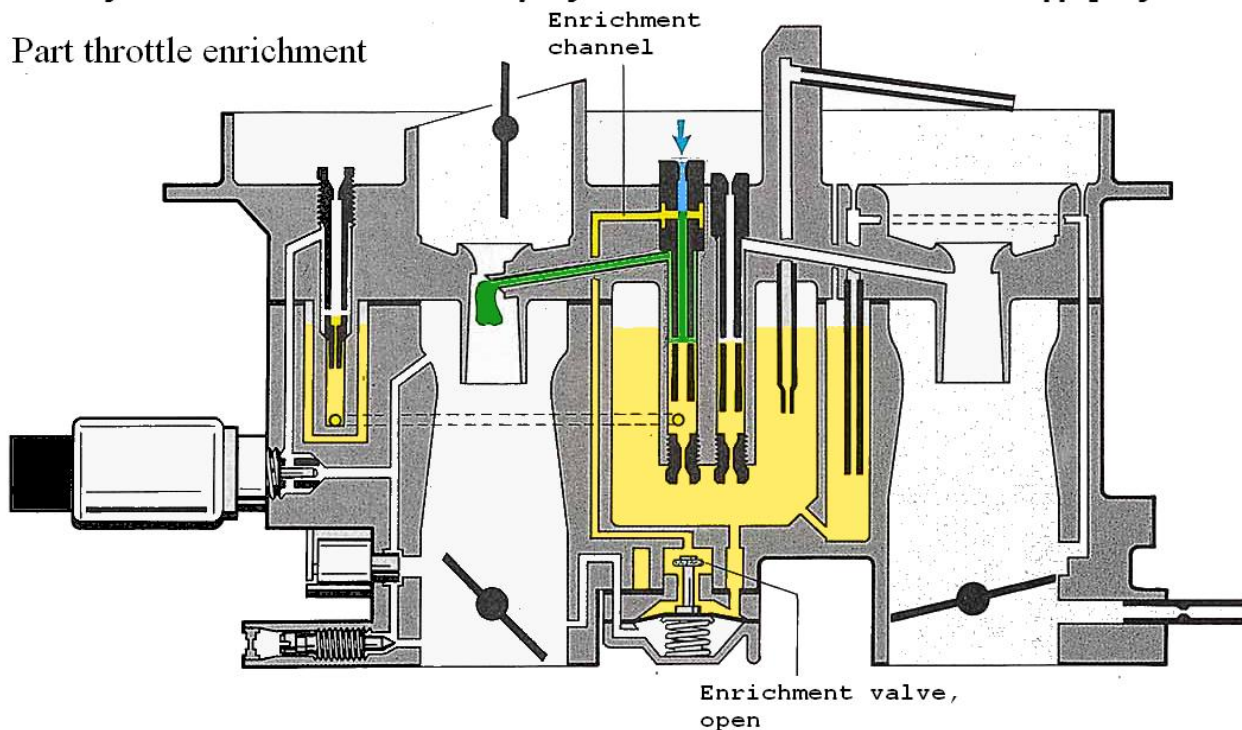
# 2E3 Carburetor Functions

Part throttle



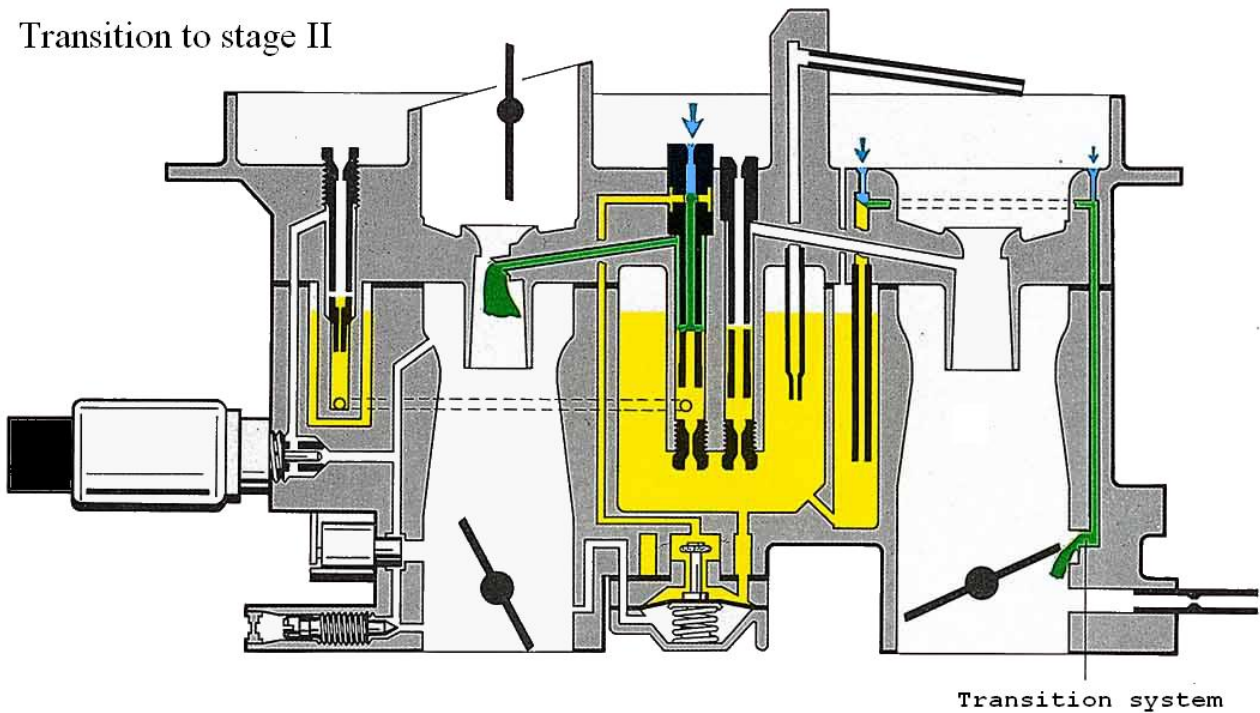
If the throttle valve is opened still further, the drop in pressure is also effective on the primary system. The fuel metered out by the main jet forms, with the air from the air correction jet, a pre-mixture, which passes into the mixing chamber via the pre-atomizer. The idling mixture orifice and the progression slot are also still supplying mixture.

Part throttle enrichment



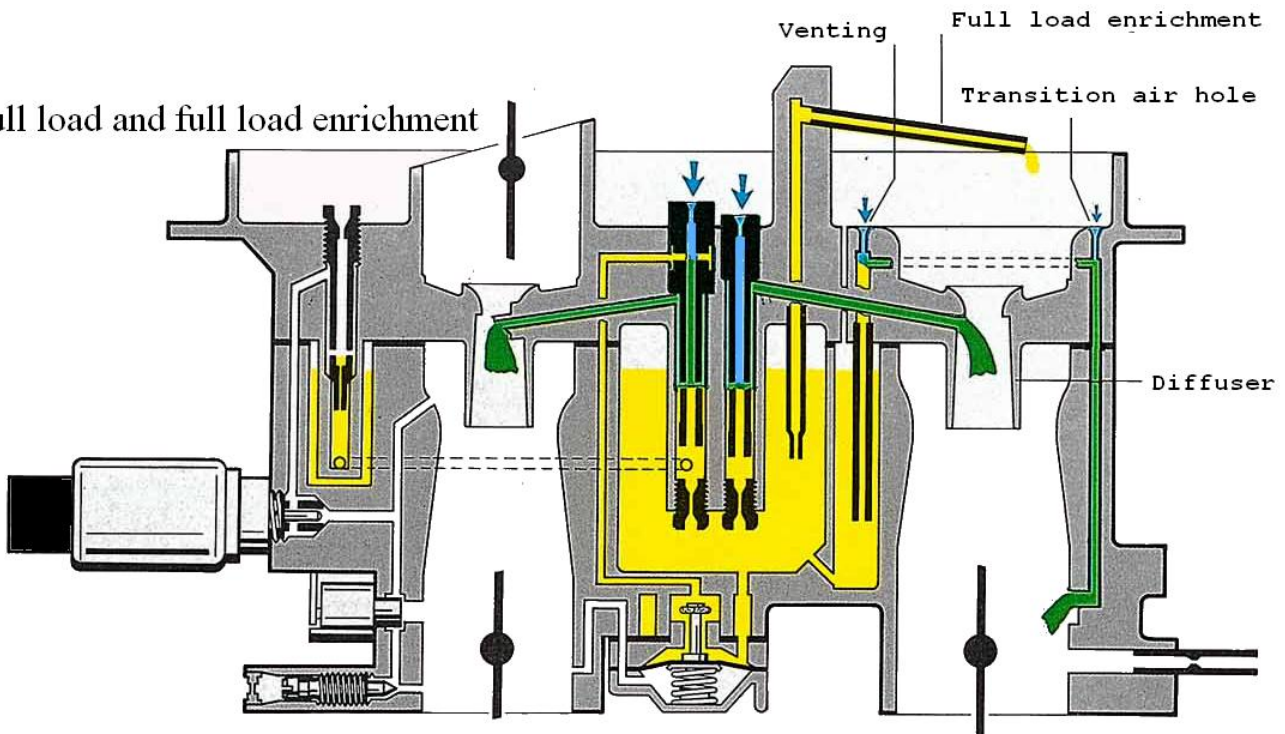
At a predetermined opening of the throttle valve angle, the vacuum in the intake manifold decreases to such an extent that spring opens the enrichment valve. Because of this, additional fuel from the float chamber can be fed directly into the primary system via channels. The supply of pre-mixture from the idling mixture orifice and the progression slot becomes less and less until it stops altogether.

## Transition to stage II



Up to a certain position of stage I throttle plate, stage II throttle plate is locked. If a certain pressure on stage II diaphragm unit is reached, stage II throttle plate can begin to move. Thereby the transition system of stage II gets mixture from the main jet of stage II.

## Full load and full load enrichment



The stage II main system goes to progressive mode, if the lock is removed. If the pressure drop increases in diffuser area, more and more mixture is supplied from the main system. At full load, the full load enrichment nozzle adds even more mixture to cope with demand.



