Supplement:
ZENITH 35/40 INAT Two-Stage Downdraught Carburettor

Bayerische Motoren Werke AG
Service Promotion

CONTENTS

The air or mixture recirculating system

The conventional method of mixture formation at idle speed, with air entering through a varying gap at the throttle butterfly and a rich fuel-air mixture via the idle system, can no longer comply with today's stringent anti-pollution laws.
The controllable recirculating mixture or air system used on modern carburettors bypasses the throttle butterfly and thus greatly improves mixture characteristics at idle speed and on the overrun. Since the throttle butterfly gap is now only involved to a slight extent in the formation of the idle mixture, the carburettor manufacturer can set it to minimum flow on a carburettor test bench. No further adjustment is needed in the workshop. As a means of altering the engine idle speed if necessary, for instance when synchronizing carburettors, the air or mixture recirculating system itself is used.

The preset throttle butterfly supplied by the carburettor manufacturer also ensures that the control passages for pneumatic ignition control and the transition mixture passages are brought into action uniformly and precisely as specified. This too has the effect of improving exhaust emission levels.

Summary of INAT carburettor versions installed to date

INAT 35/40 without mixture recirculation or TN starter	BMW 2500 up to August 1973 BMW 528/2800/2.8 L/2800 CS/3.0 S/ 3.0 L/3.0 CS up to August 1975
INAT 32/40 with mixture recirculation, without TN starter	BMW 525/2500/2.5 CS up to August 1975
INAT 35/40 with mixture recirculation, without TN starter	BMW 3.3 L up to August 1975
INAT 32/40 with mixture recirculation and TN starter	BMW 525/2500 from September 1975 on
INAT 35/40 with mixture recirculation and TN starter	BMW 528/2.8 L/3.0 L from September 1975 on

An external feature permitting the 32/40 INAT carburettor to be distinguished from the 35/40 INAT version with mixture recirculation (and with or without TN starter) is the fuel return valve attached to the fuel feed stub pipe on the 35/40 INAT carburettor.

INAT 32/40 and 35/40 two-stage carburettors with mixture recirculating system

Apart from the mixture recirculating system and a few other minor changes, this carburettor is identical to the INAT without mixture recirculation. Apart from the additional mixture recirculating system, the carburettor still retains its conventional idling system (Fig. 1).

Fuel for mixture recirculation is taken from the float chamber, metered through a fuel jet and supplied to a bore into which the air correction pipe projects from the top. The pipe opens into the mixing chamber. In this bore the fuel and air are blended to form an emulsion. A jet governs the emulsion flow rate. The emulsion passes into a passage leading down and is there mixed with fresh air drawn in via the mixing chamber. The recirculating mixture regulating screw has a taper which alters the cross-section of the passage without affecting the basic idle setting (the airflow through the throttle butterflies, preset on the carburettor test bench). (Fig. 2.)

The fuel-air ratio remains largely constant at both small or large flow volumes, and complies with the exhaust emission regulations.

Adjustment of engine idling speed and carburettor synchronization while remaining within the exhaust emission limits for each carburettor (with exhaust probes 13 0 020 in both exhaust manifolds) must only be undertaken at the mixture recirculation regulating screw (for engine speed) and the mixture regulating screw (for exhaust emissions). Use the air cleaner simulator 13 0 000.

Warning:

The settings of the throttle stop screws must not be altered, or else the throttle butterfly gap and thus the airflow preset on the carburettor flow test bench for the basic idle speed will be lost.

The carburettor manufacturer supplies plastic caps to protect the throttle butterfly stop screws.

Fig. 1

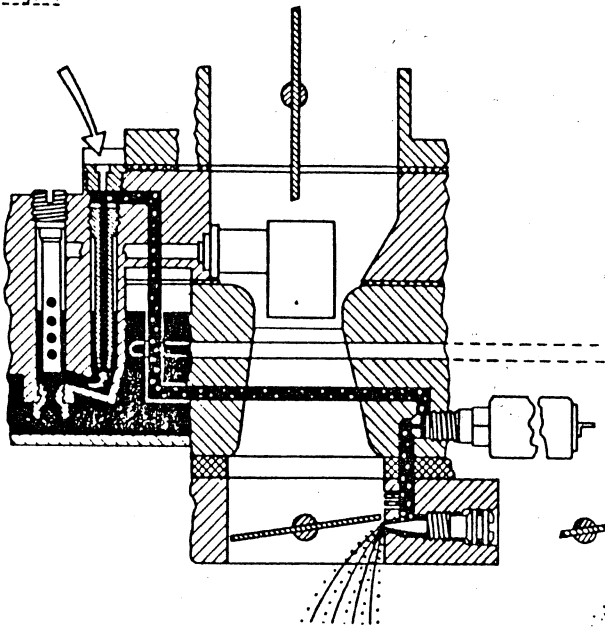
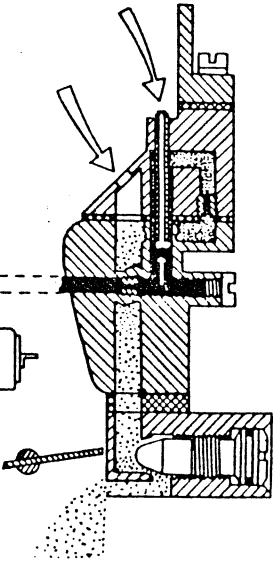
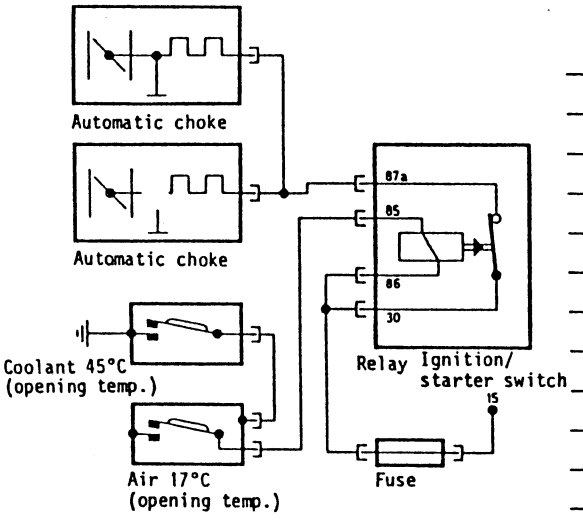


Fig. 2



Circuit diagram for electric automatic choke heating - 3.3 L



Circuit diagram for electric automatic choke heating - 525/2500/2.5 CS/528/ 2800/2.8 L/2800 CS/3.0 S/3.0 L/3.0 CS

GN = green GE = yellow BR = brown WS = white

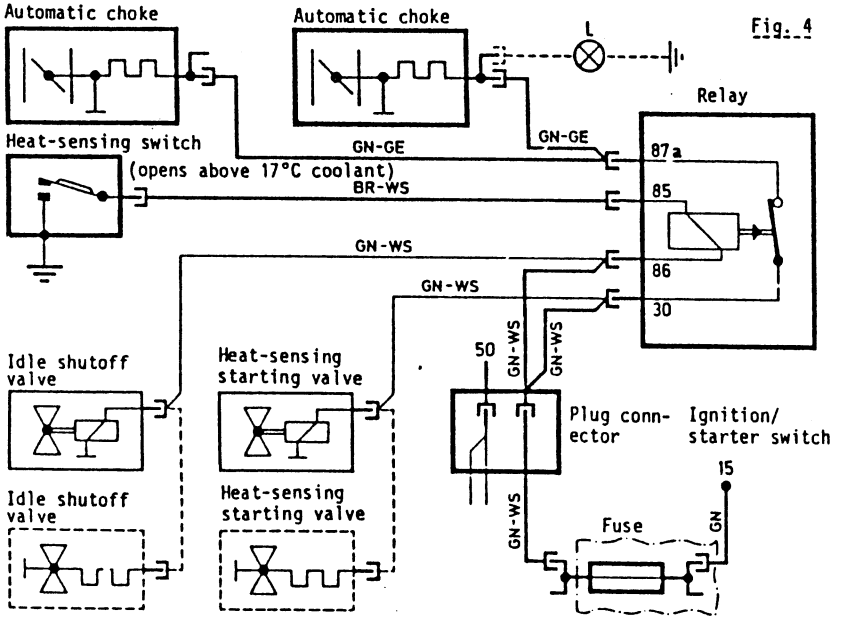
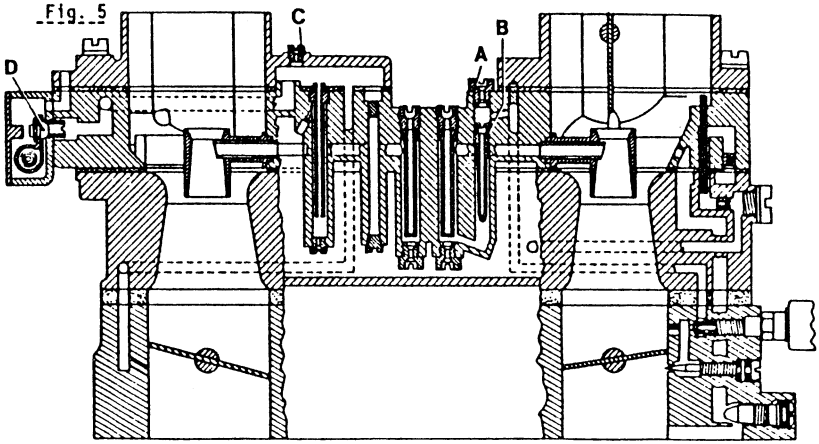


Fig. 4

Additional improvements to the 32/40 and 35/40 INAT mixture recirculating carburettors

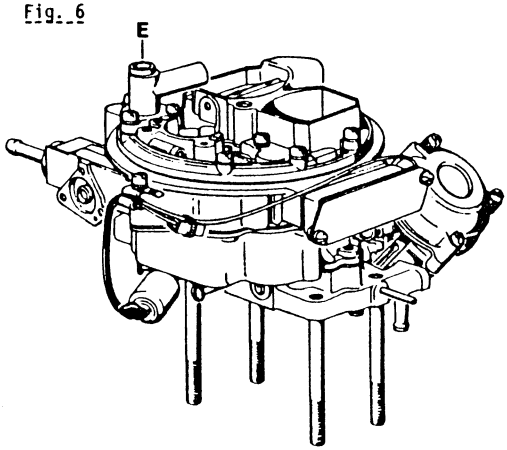
- Removal of idle air jet "A", idle fuel jet "B" and the air correction jet for heat-sensing starting device "C" can be carried out without taking off the carburettor cover (Fig. 5).
- When valve cone "D" in the heat-sensing starting valve is open, the device is no longer vented to atmosphere, but receives filtered air through the carburettor cover. This pattern of heat-sensing starting device is installed on all mixture recirculating carburettors without TN starter system (Fig. 5).

Fig. 5



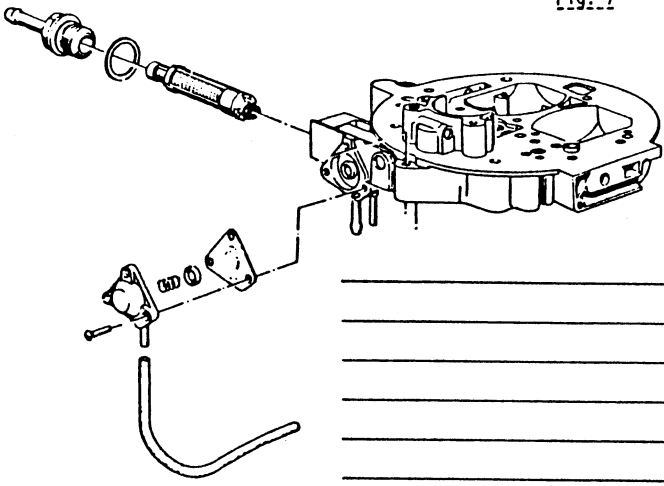
- The float chamber is now vented via air inlet/outlet pipe "E" on the carburettor cover (Fig. 6).

Fig. 6



- There is an additional mesh strainer in the fuel supply line (Fig. 7).
- On the outside of the 35/40 INAT carburettor, a fuel return valve (Fig. 7) is installed on the fuel feed stub pipe on the bedplate.

Fig. 7



INAT 32/40 and 35/40 carburettors with mixture recirculating system and TN (heat-sensing bypass) starting system

As a consequence of the technical development program and the modified anti-pollution laws, all 6-cylinder engines were converted to this pattern of carburettor.

Construction of carburettors

The design and operating principle of these carburettors are largely identical with the mixture-recirculating versions without TN starter. The following components are not installed on carburettors with TN starter:

- the heat-sensing starting device previously used
- the stepped cam for the automatic choke mechanism
- the warm water (coolant) heating system for the automatic choke

TN (heat-sensing bypass) starting system (Fig. 8)

The heat-sensing bypass starting system is flange-mounted to the front carburettor and is provided with a cross-pipe between the two intake manifolds so that it acts on all 6 cylinders.

The principal components are:

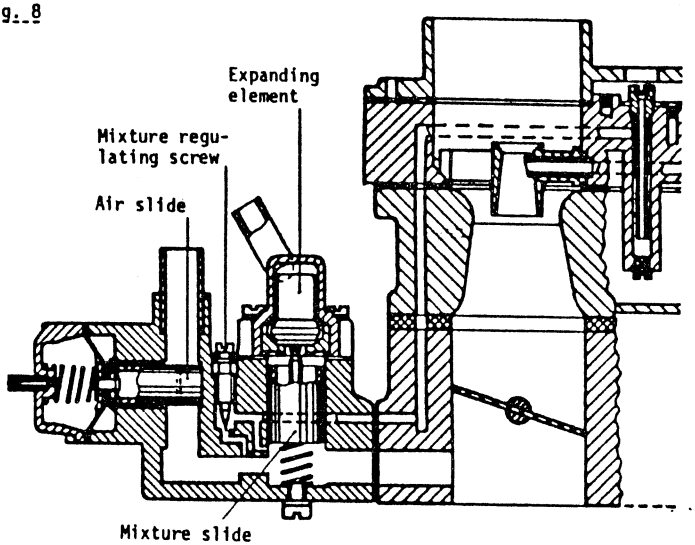
- the mixture slide valve, controlled by an expanding element
- the air slide, controlled by vacuum (manifold depression)
- the mixture regulating screw.

The expanding element is heated up as the engine's coolant grows warm, and alters the setting of the mixture slide: it closes the valve against the action of a spring as the coolant temperature rises.

The air slide opens, again against spring loading, when vacuum acts on the diaphragm, and frees the air passage.

Fuel for the mixture is drawn from the float chamber via a jet. Air flows in through an air jet and forms an emulsion by mixing with the fuel. In the air passage the emulsion is used to prepare the fuel-air mixture, and is then drawn in via stage 2.

Fig. 8



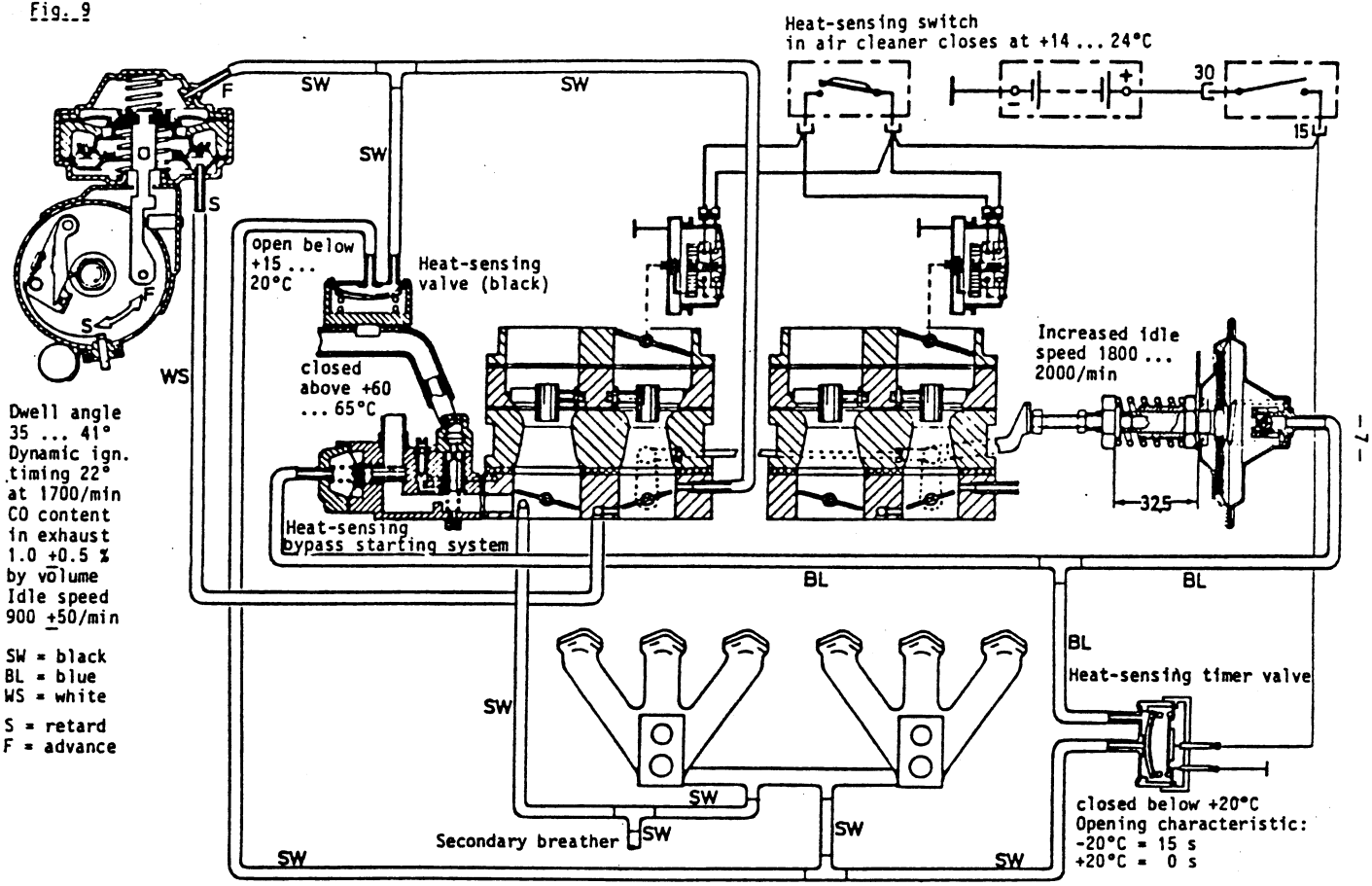
Automatic choke (Fig. 9)

This acts on the stage 1 sections of the carburettors. The choke covers incorporate not only the basic heating system for the bimetallic springs but also an electrical heating element. The basic heating system comes into operation when the ignition is switched on. The additional heating elements are controlled by a thermostat in the air cleaner which responds to intake air temperature.
A vacuum-controlled pulldown is provided on the automatic choke, and opens the choke butterfly to a preset gap as soon as the engine starts.

Throttle butterfly adjuster (Fig. 9).

The vacuum-actuated adjuster sets the stage 1 throttle butterflies to a predetermined gap when the engine is stopped and during starting. When vacuum is developed (manifold depression), the diaphragm moves the adjusting plunger against the spring and the throttle butterflies revert to the idle position. This device replaces the well-known stepped cam disc on the automatic choke.

Fig. 9



Dwell angle
35 ... 41°
Dynamic ign.
timing 22°
at 1700/min
CO content
in exhaust
1.0 ±0.5 %
by volume
Idle speed
900 ±50/min

SW = black
BL = blue
WS = white

S = retard
F = advance

Heat-sensing timer valve (Fig. 9)

This is an open/closed valve actuated by a bimetallic element. It is electrically heated and opens after a period of time governed by ambient air temperature. Below +20°C the valve remains closed and blocks the control vacuum from the intake manifold cross-pipe to the throttle butterfly adjuster and the TN starting system.
The electrical heating begins to operate when the ignition is turned on. The heating period before the valve opens is 15 seconds at -20°C, reducing to 0 seconds at +20°C.

Heat-sensing switch (Fig. 9)

This controls the elctrical auxiliary heating for the bimetallic springs in the choke covers according to intake air temperature. At an intake air temperature below 14 ... 24°C the switch is open. Above 14 ... 24°C the switch closes and the auxiliary heating element is energized.

Heat-sensing valve (Fig. 9)

This responds to coolant temperature and controls changeover of ignition control (vacuum) from 'retard' to 'advance'. The valve is open below 15 ... 20°C, so that the vacuum control tapping from the intake manifold cross-pipe can reach and act upon the 'advance' can at the distributor and alter ignition timing accordingly.

If the same vacuum is present at both the 'advance' and 'retard' cans, preference is given to ignition advance.
Above 15 ... 20°C the heat-sensing valve is closed and ignition advance and retard are controlled by vacuum in response to throttle butterfly movement.

Operating principle of carburettors

Cold starting and warming-up (Fig. 9)

The vacuum-controlled throttle butterfly adjuster maintains the throttle butterfly at a predetermined opening angle. This enables the vacuum (partial manifold depression) developing below the closed choke butterfly when starting a cold engine to take effect - in the mixing chamber - and cause fuel to be drawn out of the main jet system. At the same time a richer mixture is drawn in via the TN starting system.

Vacuum in the mixing chamber acts also on the closed choke butterfly, overcomes the spring loading exerted by the bimetallic spring and opens it sufficiently for the air needed to form the starting mixture to flow in. As soon as the engine has started the vacuum-actuated pulldown opens the choke butterfly to a preset gap, to help prevent an over-rich mixture from developing.

The control circuit vacuum can act via the intake cross-pipe and the open heat-sensing valve on the 'advance' can of the distributor and thus advance the ignition.

When the cutout time of the heat-sensing timer valve is reached (15 s at -20°C), the valve opens. The control vacuum from the intake cross-pipe then acts on the throttle butterfly adjuster; the diaphragm and adjusting plunger are pulled up and the throttle butterflies revert to the idle position. At the same time the vacuum takes effect at the TN starting system, pulls up the diaphragm with air slide, opens the air passage and weakens the rich starting mixture.

The air inlet in the open air slide of the TN starter, together with advancing of the ignition, ensure that engine speed does not drop too far and improve cold-engine running.

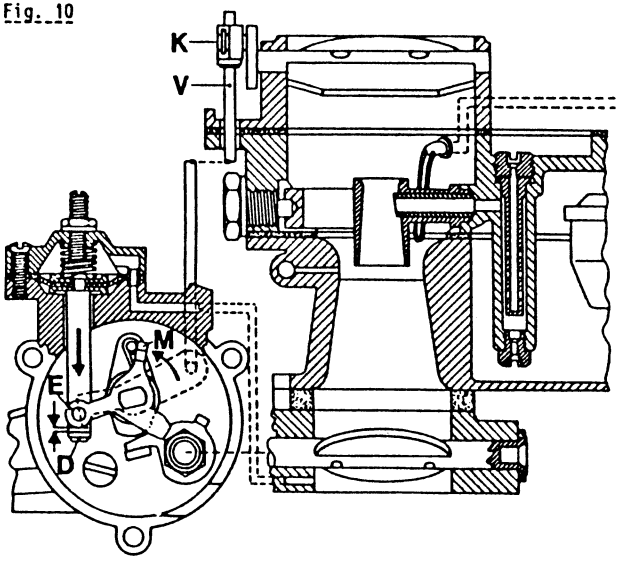
The correct mixture proportions for the engine warming-up phase are supplied - according to the vacuum below the throttle butterfly - by the idling system (consisting of the idle mixture and additional mixture systems) and the TN starter with its own mixture system. The mixture slide of the TN starter, which is actuated by the coolant-heated expansible element, regulates the mixture volume in accordance with engine temperature. When a coolant temperature of 60 ... 65°C is reached, the mixture slide valve is closed and the mixture system out of action. Mixture formation for engine idling is then limited to the normal idle and additional mixture systems.

Adjustment work on INAT carburettors with TN starting system

Adjusting the starting system connecting rod (Fig. 10)

- The starting system (choke) cover must be detached
- Turn actuating lever (M) to the left; with the choke butterfly closed there must be a gap of 0.2 ... 0.5 mm between the actuating lever (E) and the pulldown rod (D).
- Adjust if necessary at clamp bolt (K), by moving connecting rod (V).
- Push the clamp ring up against the clamp block until no play is present.

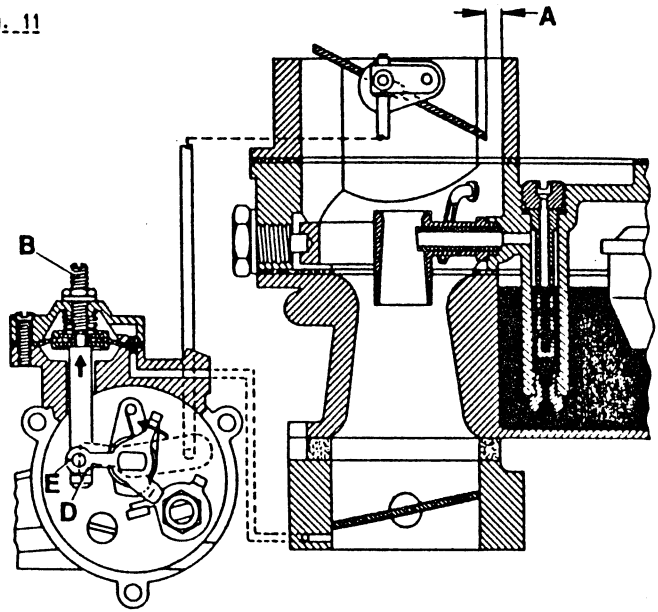
Fig. 10



Adjusting choke butterfly opening angle (Fig. 11)

- Press diaphragm pull rod (D) fully upwards, move eye (E) of actuating lever against it and check that the choke butterfly gap A is 2.5 ±0.2 mm at the lobe of the butterfly which points down.
- Adjust if necessary at stop screw (B).

Fig. 11

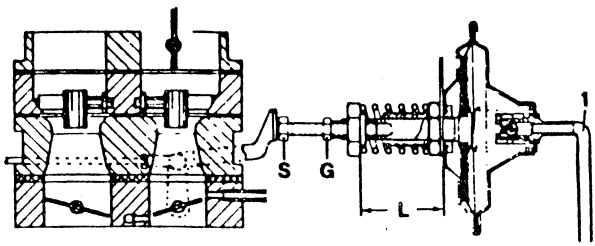


Adjusting increased idling speed (Fig. 12)

The engine must be at normal operating temperature, the dwell angle, ignition timing, idle speed and CO content of the exhaust to specification and the spring preload at throttle butterfly adjuster L = 32.5 mm.

- Pull off the vacuum ignition retard hose and block at carburettor end.
- Pull off vacuum hose "1" at the throttle butterfly adjuster, and block. Do not accelerate after this has been done.
- Slacken locknut (G) and turn screw (S) for the throttle butterfly adjuster until the increased idle speed is 1800 ... 2000/min.
- Reconnect vacuum hose "1", then detach it again and check that the increased idle speed has not altered. Repeat the adjustment if necessary.
- Re-attach vacuum hose "1".
- Re-attach the vacuum ignition retard hose.

Fig. 12



Adjusting the TN starting system (Fig. 13)

If a control plunger (3) or water connecting cover with expansible element (1) has to be renewed, the TN starter must be adjusted again as follows:

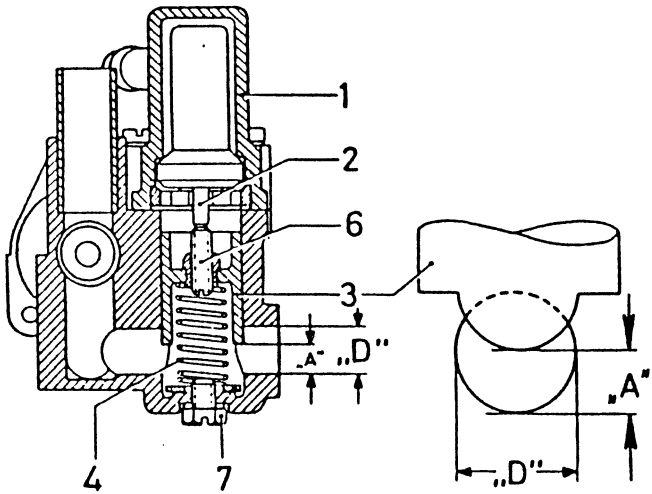
- leave the TN starter unit in a water-bath at 20° ±3° C for 10 minutes so that the temperature stabilizes.
  Note: there are two available diameters "D" - note when adjusting.
- If diameter "D" is 6.4 mm, gap "A" must measure 3.1 mm.
- If diameter "D" is 9.0 mm, gap "A" must measure 4.4 mm.
- Check with a twist drill of 3.1 or 4.4 mm diameter.
- Adjust at the plunger adjusting screw (6) after detaching the screw plug (7).

Resetting of the TN starting system during routine inspection or maintenance work is neither necessary nor permissible. The mixture ratio (fuel-air) and the flow rate related to plunger stroke are set up on the carburettor flow test bench.

If the mixture regulating screw of the TN system has been disturbed, coarse adjustment is as follows:

- turn the mixture regulating screw fully to the right, then unscrew to the left for two and a half full turns.

Fig. 13



Basic setting for stage 1 throttle butterflies - INAT 32/40 and 35/40

Mixture recirculating carburettors (including TN versions) with vacuum advance and retard ignition control

This adjustment procedure enables the workshop to restore the correct airflow rate approximately for the basic idle setting.

- Take off the air cleaner and attach the air cleaner simulator.
- Pull off the ignition retard vacuum hose and block at carburettor end.
- Detach the adjustable connecting linkage.
- Insert exhaust emission probes in both exhaust manifolds.

- The engine must be running and have reached normal operating temperature.
- Attach the 'Synchrotester' carburettor synchronizing device.
- Screw the recirculating mixture regulating screws in fully.
- Synchronize the engine at the throttle stop screws to an idle speed of 900/min.
- Adjust both carburettors until the CO content of the exhaust is 3 % by volume, using the mixture regulating screws.
- From this point on, the throttle lever stop screws must not be adjusted any further.
- Reconnect the vacuum hose for ignition retard; engine speed will then drop.
- Restore the idling speed of 900 +50/min by unscrewing the two mixture recirculation regulating screws to an equal extent.
- Adjust the CO emissions level of both carburettors by means of the mixture regulating screws until the specified value for idling speed is obtained.
- Reconnect the adjustable linkage.
- Check carburettor synchronization at 1700/min.
- Install the air cleaner.
- Check CO emissions and engine idling speed again.
- Remove the exhaust emission probes and screw the sealing plugs back into the manifolds.

Basic setting of stage 1 throttle butterflies - INAT 32/40

Mixture recirculation carburettor with vacuum ignition advance only

The adjustment procedure outlined below enables the workshop to restore the approximately correct airflow for the basic idling setting.

- Detach the air cleaner and install the air cleaner simulator.
- The vacuum hose for ignition advance remains in position.
- Detach the adjustable connecting linkage.
- Insert exhaust emission probes into both exhaust manifolds.
- Run the engine (which must have reached its normal operating temperature).
- Attach the 'Synchrotester' carburettor synchronizing device. (Use caps of 12 mm diameter.)
- Screw the mixture recirculation regulating screws fully in.
- Synchronize the carburettors with the throttle stop screws to 700/min.
- Adjust the CO emissions level for both halves of the engine to 3 % by volume with the mixture regulating screws.
- From this point on, do not disturb the settings of the throttle stop screws any more.
- Obtain an engine idling speed of 900 +50/min by unscrewing the mixture recirculation regulating screws by similar amounts.
- Adjust the CO emissions level for both halves of the engine to the specified idling-speed value.
- Remove the 12 mm inserts from the caps of the synchronizing device.
- Re-attach the adjustable connecting linkage.
- Check synchronization at a speed of 1700/min.
- Install the engine's intake air cleaner again.
- Check CO emissions and engine idling speed again.
- Remove the exhaust probes and seal the manifolds with the screw plugs.

Checking fuel level in float chamber

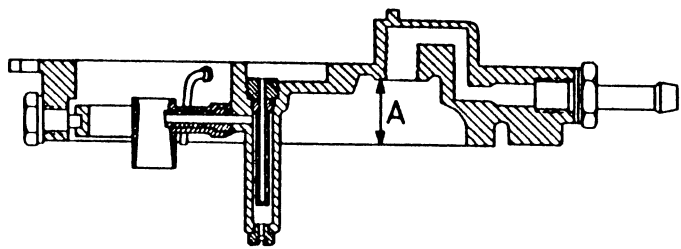
The fuel level on all INAT 32/40 and 35/40 carburettors is governed by distance "A", measured from the joint face of the bedplate to the contact face of the float needle valve (without gasket) (Fig. 14).

This distance should be as follows:

INAT 32/40	20.5 ... 21.0 mm
INAT 35/40	19.0 ... 19.5 mm

If the measured distance is wtihin this tolerance range, install a 1 mm thick sealing ring between float needle valve and bedplate.
If the actual distance is out of tolerance, correct by altering the sealing ring thickness. Before the measurement is taken, the float mounting must be in good working order.

Fig. 14



Adjustment data (engine at normal operating temperature)

INAT 32/40 and 35/40 with mixture recirculating system

Dwell angle	35 ... 41°
Ignition timing, dynamic, without vacuum advance and retard	22° before TDC at 1700/min
CO content	1.5 ... 2.5 % by volume
Idling speed	900 ±50 /min
Fast idle speed per carburettor,	
32/40	1400 /min
35/40	1600 /min

Note: detach vacuum retard hose for this test and block at carburettor end.

INAT 32/40 and 35/40 with mixture recirculating system and TN starting system

Dwell angle	35 ... 41°
Ignition timing, dynamic, without vacuum advance and retard	22° before TDC at 1700/min
CO content	1.0 ±0.5 % by volume
Increased idling speed (with throttle butterfly adjuster)	1800 ... 2000/min
Normal idling speed	900 ±50/min

Note: to determine increased idling speed, detach vacuum ignition retard hose and block at carburettor end.

Anti-tampering seals at carburettors

In accordance with ECE exhaust emission control directives, all vehicles from model year 1977 on must have provision for preventing unauthorized persons from tampering with the settings which affect exhaust pollutant emission levels.

All carburettors are therefore provided with caps or plugs at the adjusting screws for the idle and additional mixtures so that the settings cannot be altered without destroying the protective anti-tampering devices.

The caps and plugs have various colours for identification:

white - initial equipment from carburettor manufacturer
yellow - initial equipment from vehicle manufacturer
blue - replacements installed by Service organization

Whenever the idle speed or exhaust emission level are adjusted, the screws are to be protected afterwards with blue caps or plugs.

When adjusting, always a screwdriver with the correct flat blade pattern, or else the screw slots will be damaged and the anti-tampering protection will not fit over the screw correctly.

When renewing a complete carburettor, note that on vehicles from model year 1977 onwards only carburettors with provision for the installation of anti-tamper screws should be used.

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Trouble-shooting — Zenith 32/40 and 35/40 INAT two-stage downdraught carburettors

Note that this trouble-shooting chart makes no claim to completeness, and assumes that the following items are in good working order:
1. Normal compression in all cylinders
2. Correct valve clearances
3. Ignition system operating correctly

1. Engine does not start when cold, or starts only with great difficulty

Cause	Explanation	Remedy
1.1 Choke butterfly not closing	Choke butterfly or connecting linkage stiff	Free stiff or sticking components
	Bimetallic spring broken or out of adjustment	Set choke cover to correct marking, or renew
	Choke housing in wrong relative position to choke butterfly	Adjust automatic choke; see Repair Manual, 13 11 044 A
1.2 Throttle butterflies not advanced sufficiently	Throttle butterfly adjuster setting is incorrect	Adjust increased idle speed; see Repair Manual, 13 11 065 C
	Increased idle speed setting incorrect	Adjust increased idle speed; see Repair Manual, 13 11 044 D
1.3 TN starting system not supplying additional mixture	Mixture slide valve in TN starter is closed	Free mixture slide; if necessary renew TN starter
	Mixture regulating screw on TN starter out of adjustment	Adjust mixture regulating screw; see Repair Manual, 13 11 065 D
	Fuel jet for TN starter blocked	Clean front carburettor

2. Engine starts from cold but will not continue running

2.1 Fuel-air mixture too weak	All checks described in 1.3.	All work described in 1.3.
	Choke butterfly gap too large	Adjust automatic choke; see Repair Manual, 13 11 044 A
	TN starter mixture plunger out of adjustment	Adjust opening gap of mixture plunger; see Service Information SI 13 03 76 (60)
	Heat-sensing timer valve not closing	Renew heat-sensing timer valve
	Bimetallic spring preload too small	Increase tension at bimetallic spring
	Mixture enrichment from TN starting system is insufficient	Adjust exhaust emissions level via TN starter mixture regulating screw to 5 ... 8 % by volume at 20°C
2.2 Fuel-air mixture too rich	Pull-down not working	Check pulldown mechanism; renew defective components
	Choke butterfly gap too small	Adjust automatic choke; see Repair Manual 13 11 044 A
	TN starter air correction jet blocked	Clean jet
	Heat-sensing starting device does not cut out	Check heat-sensing starting valve and renew if necessary; see Repair Manual 13 11 059
	Air plunger in TN starter does not open	Check vacuum control system (diaphragm, hose connections and heat-sensing timer valve)
	Mixture regulating screw on TN starter out of adjustment	See 1.3
2.3 Vacuum ignition retard system is working	Heat-sensing valve has a fault; vacuum line leaking	Renew heat-sensing valve (AA 11) or seal leaks in vacuum hoses

3. Engine runs very irregularly when warming up, or stalls

Cause	Explanation	Remedy
3.1 Choke butterflies open too slowly	Choke butterflies or actuating linkage stiff	Free stiff or sticking components
	Fault in electrical heating of automatic choke	Check control system for electrical bimetallic spring heating against circuit diagram; renew any defective components
3.2 Heat-sensing starting device not cutting out	Heat-sensing starting valve has failed or power supply is interrupted	Check heat-sensing starting valve, and renew if necessary; see Repair Manual, 13 11 059
3.3 Too little or too much mixture enrichment via TN starting system	Mixture plunger setting is incorrect	See 2.1
	Mixture regulating screw on TN starter is out of adjustment	See 1.3

4. Engine pulls badly when cold

4.1 Fuel-air mixture too weak	Insufficient preload at bimetallic spring	Correct tension on bimetallic spring
	Too little mixture enrichment from TN starting system	See 2.1
4.2 Choke butterflies open too quickly	Fault in electrical control system for automatic choke heating	See 3.1
4.3 No intake air preheating	Intake air preheating flap in wrong position or not working	Adjust flap, free if necessary or renew expansible element; see Repair Manual, 13 73 004

5. Engine starts badly when warm

5.1	Automatic choke cuts in too soon when engine is still warm	Insufficient heating of choke cover by coolant flow	Check coolant flow, repair as necessary
5.2	Fuel-air mixture is too rich	Float level too high Float needle valve leaking	Correct fuel level (see SI 13 01 76 (54)) Renew float needle valve; see Repair Manual 13 11 241
5.3	Intake air preheating is not cutting out	Intake air preheat flap is out of adjustment or not working	See 4.3

6. Faults at engine idle speed

6.1	Engine will not idle	Idle shutoff valves not working	Check power supply and repair if necessary; renew shutoff valve
		Paper gasket at insulating flange is out of position	Renew insulating flange, skim throttle butterfly unit flat
		Idle fuel or air jet blocked	Clean idle system
		Float needle valve leaking	See 5.2
6.2	Idling speed too high	Throttle lever stop screws out of adjustment	Follow basic adjustment procedure for stop screws (see pages 24/25)
		Throttle butterflies stiff to move	Free throttle butterflies
		TN starter does not cut out	Repair TN starter or renew expanding element or complete TN starter unit
		Heat-sensing valve does not close above 20°C (vacuum ignition advance working at idle speed)	Renew heat-sensing valve (AA 11)

Cause	Explanation	Remedy
	Throttle butterfly adjuster does not retract	Check vacuum connection and repair if necessary or renew heat-sensing timer valve
	Stage 2 throttle butterflies not closing	Follow basic adjustment procedure for stage 2 throttle butterflies (see Repair Manual, 13 11 412)
	Carburettors not properly synchronized	Synchronize carburettors (see Repair Manual, 13 11 412)
6.3 CO level is too low and cannot be corrected	Air is leaking into the intake system from the outside, e.g. through defective manifold gaskets, leaking carburettor flanges or damaged rubber sealing rings at mixture or recirculation regulating screws	Spray suspect components with fuel to trace leak, then repair
	Blocked fuel jet in idling or mixture recirculation systems	Clean carburettor
6.4 CO level is too high and cannot be corrected	Blocked air jets in idling or mixture recirculation systems	Clean carburettor
	Diaphragm at fuel return valve has failed	Renew diaphragm
	Float needle valves defective	See 5.2
	Heat-sensing starting device does not cut out	Check venting of heat-sensing starting valve, repair if necessary or renew heat-sensing starting valve

7. Poor transition (throttle response) when engine is warm (misfiring)

7.1	Fuel-air mixture too weak	CO value adjusted incorrectly	Adjust carburettors correctly
		Leak at insulating flange on throttle butterfly unit	Renew insulating flanges Skim throttle butterfly unit flat
		Worn throttle butterfly shafts	Renew throttle butterfly section
		Stage 2 throttle butterfly air gaps too large	Carry out basic setting procedure for stage 2 throttle butterflies (see Repair Manual, 13 11 412)
		Too little preload at sprung stop for stage 2 throttle butterflies	See Repair Manual, 13 11 412
		Incorrect injected fuel volume and spray direction at accelerator pump	Adjust injected fuel volume and direction of spray (see Repair Manual, 13 11 054)
		Float level too low	Correct fuel level (see SI 13 01 76 (54))
7.2	Fuel-air mixture too rich	Float level too high	See 7.1
		Incorrect injected fuel volume and spray direction at accelerator pump	See 7.1
7.3	Stage 1 throttle butterflies not opening together	Carburettors not synchronized	Synchronize carburettors; see Repair Manual, 13 11 004

8. Low engine power output

Cause		Explanation	Remedy
8.1	Stage 1 throttle butterflies not opening fully	Accelerator linkage out of adjustment	Adjust accelerator linkage correctly
8.2	Stage 2 throttle butterflies not opening	Stage 2 throttle butterflies sticking	Free throttle butterflies; if necessary correct gap
		Vacuum control not working (defective diaphragm or seal at vacuum can)	Repair vacuum control system
		Vacuum diaphragm pull rod out of adjustment	Adjust pull rod; see Repair Manual, 13 11 412
8.3	Stage 2 throttle butterflies opening too late	Incorrect spring in vacuum can	See Repair Manual, 13 11 412
		Leak in vacuum control system	Seal vacuum control system
8.4	Insufficient fuel supply	Blocked mesh strainer in immersed fuel tank suction head	Clean or renew mesh strainer; see Repair Manual, 16 12 000
		Fuel pump discharge rate too low	Check pump pressure and renew pump if necessary; see Repair Manual, 13 31 009
		Blocked mesh strainer in fuel supply stub pipe at carburettor	Clean mesh strainer
		Defective fuel return valves	Check or renew return valves
		Float level too low	Correct fuel level (see SI 13 01 76 (54)).

9. High fuel consumption

9.1 Intake air preheating does not cut out	See 4.3	See 4.3
9.2 Fuel-air mixture too rich	Float needle valves leaking	See 5.2
	Float level too high	See 7.1
	Choke butterflies open too slowly	See 3.1, all points
	Heat-sensing starting device does not cut out	See 6.4
	TN starting system does not cut out	See 6.2
	Fuel pump pressure too high	Check pump pressure and renew pump if necessary; see Repair Manual, 13 31 009
	Idling speed settings incorrect	Adjust carburettors
	Connecting hose between air cleaner and front section is missing	Install connecting hose
	Accelerator pump injection pipe set too low	See Repair Manual, 13 11 054

Basic adjustment procedure for stage 1 throttle butterflies on INAT 32/40 with mixture recirculation system and vacuum ignition advance only

This adjustment procedure will enable the workshop to restore the approximately correct airflow for the basic idling speed.

Detach air cleaner and install air cleaner simulator.

Leave the vacuum hose for ignition advance attached.

Detach the adjustable connecting linkage.

Install exhaust emission probes in both exhaust manifolds.

Engine must be running at normal operating temperature.

Connect 'Synchrotester' with 12 mm diameter cap inserts.

Tighten the mixture recirculation regulating screws fully.

Synchronize engine with throttle lever stop screws to 700/min.

Adjust the CO level for both carburettors to 3 % by volume with the mixture regulating screws.

After this, the throttle lever stop screw settings must not be altered.

Obtain a synchronized idling speed of 900 $\pm$50/min by unscrewing the mixture recirculation regulating screws.

Reset the CO emission levels for both carburettors at the mixture regulating screws to the specified value at engine idling speed.

Remove the 12 mm inserts from the Synchrotester caps.

Re-attach the adjustable connecting linkage.

Check synchronization at 1700/min.

Install the air cleaner.

Check CO level and idling speed again.

Remove the exhaust probes and insert the screw plugs.

Basic adjustment procedure for stage 1 throttle butterflies on INAT 32/40 and 35/40 carburettors with mixture recirculation system (including version with TN starting system), and with vacuum ignition advance and retard

This adjustment procedure will enable the workshop to restore the airflow at engine idle speed to an approximately correct value.

Detach the air cleaner and install the air cleaner simulator.

Pull off the vacuum ignition retard hose and block at carburettor.

Detach the adjustable connecting linkage.

Insert exhaust emission test probes into exhaust manifolds.

Run the engine, which must be at normal operating temperature.

Attach the 'Synchrotester' with 12 mm diameter cap inserts.

Tighten the mixture recirculation regulating screws fully.

Synchronize the engine at 900/min using the throttle lever stop screws.

Adjust the CO levels for both carburettors with the mixture regulating screws to 3 % by volume.

After this, the throttle lever stop screw settings must not be altered.

Reconnect the vacuum ignition retard hose.

The engine speed will drop.

Reset idling speed to 900 +50/min by slackening the mixture recirculation regulating screws (both to an equal extent).

Reset the CO values for both carburettors to the specified value for engine idle speed.

Remove the 12 mm inserts from the caps of the 'Synchrotester'.

Re-attach the adjustable connecting linkage.

Check synchronization at 1700/min engine speed.

Attach the air cleaner.

Check CO value and engine idling speed.

Remove the exhaust probes and insert the screw plugs.