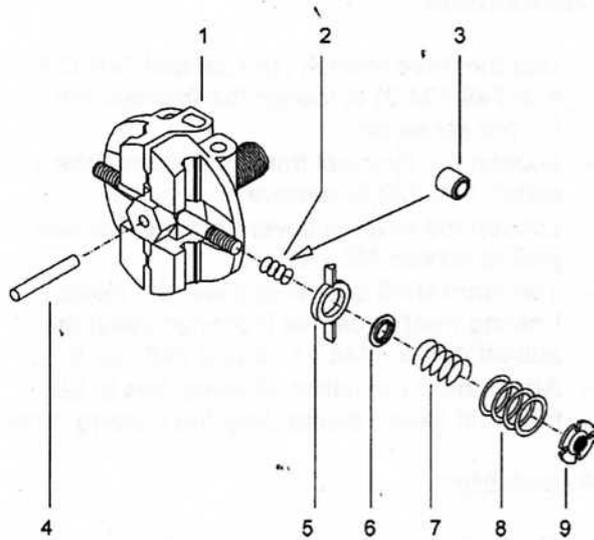


7. Special Components

7.1.1 Centrifugal Speed Governor



- 1 Governor body
- 2 Governor spring - middle speed range in the case of a variable-speed governor
- 3 Spacer (instead of item 2 for end governor)
- 4 Governor pin
- 5 Spring bridge
- 6 Guide bush
- 7 Governor spring: full load rev/min
- 8 Governor spring: idling rev/min
- 9 Cross slotted nut

7.2 Crankshaft, Flywheel



ATTENTION



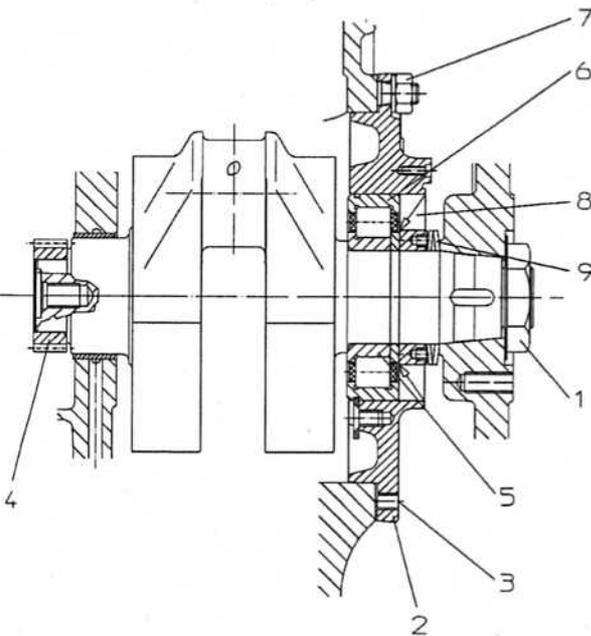
CAUTION

- If the flywheel is removed from the complete engine, the acceleration lever must previously be set to 'full load'.

Dismantling:

- Use the drive wrench (special tool 748.128.4 and 748.154.2) to loosen the flywheel nut. Do not screw off.
- Loosen the flywheel from its seat with the puller, 748.122.6; remove it.
- Loosen the bearing cover from the slot with pulling screws M8 x 40.
- The crankshaft gear wheel and the inside bearing washer can be loosened using the pull-off device, 748.137.2 and 748.132.6.
- **Attention!** Lubrication oil pump has to be taken off before dismantling the bearing plate

Assembly:



- The inside bearing washer and the crankshaft gear wheel are mounted hot. (4) + (5)
- The inside bearing washer and the cylindrical roller bearing are always paired.
- Gently hammer the bearing cover (2) to achieve a snug fit in the seat (PVC hammer), and then use the securing nuts (7) to tighten on alternate sides.
- Generally renew the shaft seal (8).
- Assemble the fitting parts and the flywheel according to the sequence (see drawing).
- Mounting of lubrication oil pump.
- The fitting surfaces must be free of grease and dirt.
- Please note the position of the disk springs (9).
- Tighten the flywheel using a torque wrench or a drive wrench (see Table of Torques).



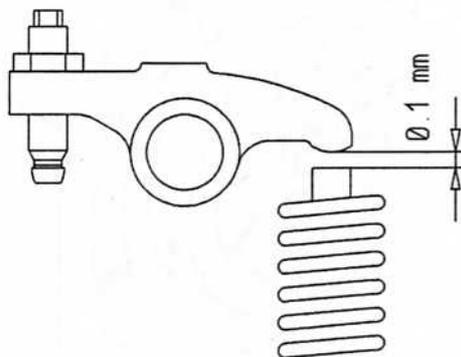
CAUTION

8. Adjustments, Settings

8.1 Valve Setting

The valve clearance for both valves is 0.1 mm (cold). The valve clearance must be checked for the first time after 20 operating hours and thereafter every 300 operating hours and, if necessary, is to be adjusted as follows: The clearance is to be set with the engine cold, at the end of the compression stroke with both valves closed.

Remove the valve cover. Rotate the flywheel until the mark is vertical and right-hand. Adjust the valves and refit the valve cover.



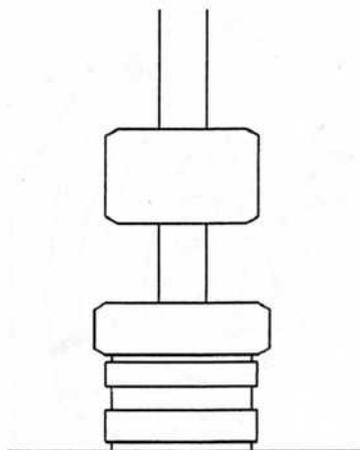
CAUTION

- To prevent unintentional starting, the high-pressure line must always be detached at the fuel injection pump.
- Fuel which leaks at high pressure at the threaded joint may cause severe injuries.



ATTENTION

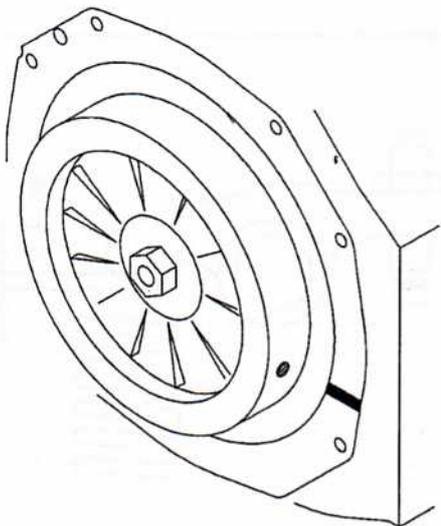
To prevent leaks, the valve cover seal is to be replaced at every adjustment.



The adjustment is to be carried out when the engine is cold.



8.1.1 Valve setting procedure



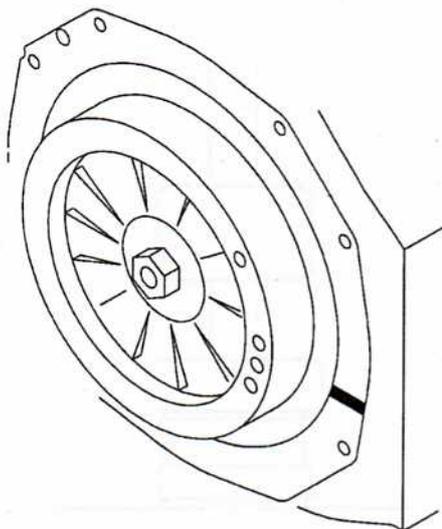
Exhaust valve:

- Turn crankshaft slowly with the starting handle until the end of the compression stroke.

 **In this position the exhaust valve is closed (max. clearance between rocker and valve) and the top dead centre mark of the flywheel points to the mark on the crankcase.**

- Check clearance between exhaust valve and rocker with a feeler gauge and, if necessary, set to 0.1 mm.

 **It must be possible to slide the feeler gauge between the valve and rocker without great force.**



Inlet valve:

- Turn crankshaft half a revolution from the top dead centre mark in the direction of rotation.

On engines with a closed flywheel housing you can't see the timing marks (O.T. = T.D.C.).

- Take off rocker cover, turn engine till piston is in O.T. (T.D.C.) position.
- Mark the position on the crank handle support bearing
- Turn engine with starting handle $\frac{1}{4}$ rotation in engine rotation sense.

 **This makes the automatic decompression ineffective.**

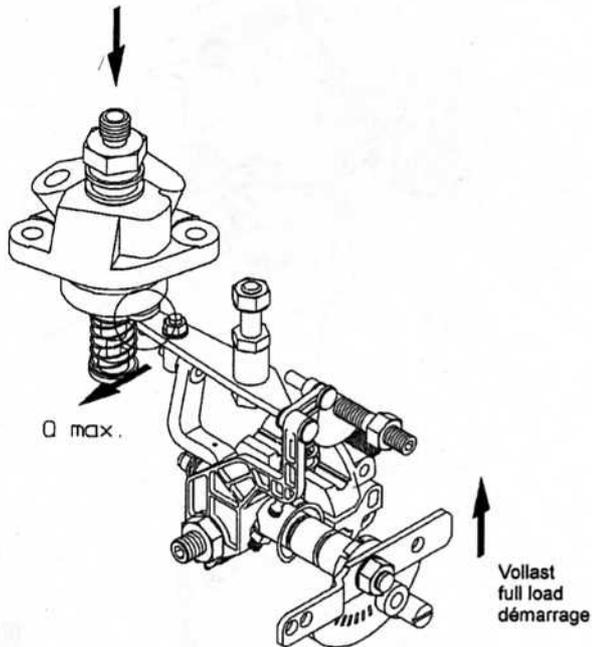
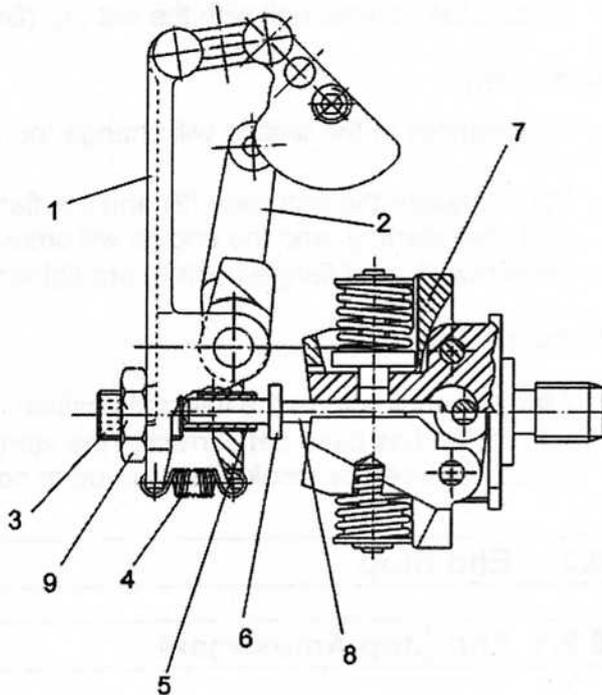
Check clearance between intake valve and rocker with a feeler gauge and, if necessary, set to 0.1 mm.

 **It must be possible to slide the feeler gauge between the valve and rocker without great force.**

8.2 Speed Adjustment / Automatic increased Start Quantity

8.2.1 Lever System Setting

- Set the acceleration lever to the "**Full Load**" position.
- Remove the setscrew (3) from the lever (1).
- Carefully unhook the spring (4) from the lever (1).
- Spread the governor weights (7) to the **maximum** extent, using a screw driver.
- Use the tool (17, Illustration 2) to turn the threaded bush (5) until the flanged bolt (6) fits on the governor pin (8) with no play.
- Remove the screw driver and **close** the threaded bush (5) by a further half revolution.
- Carefully hook the spring (4) to the lever (1).



8.2.2 Automatic Enriched Starting Mixture (ESM) Setting

- Set the acceleration lever to the "Full Load" position.
- Screw the setscrew (3) into the lever (1) until contact is made with the flanged bolt (6).
- Secure the flanged bolt with the nut (9). (See Illustration 4.1.1)

Attention:

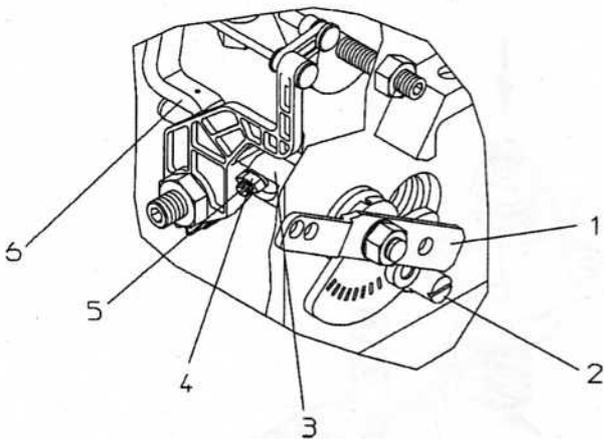
- Divergences in the setting will change the active period for the enriched starting mixture (1)
- Play between the setscrew (3) and the flanged bolt (6) = ESM is active for a longer period after starting, and the engine will smoke.
- Setscrew (3) and flanged bolt(6) are tightened = ESM function is not guaranteed.

Function Test:

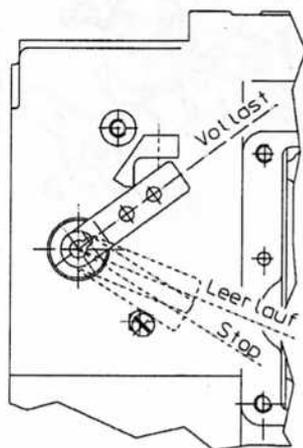
- Start the engine from the full load position.
- If the ESM has been set correctly, the starting smoke period will last about 2-3 seconds. This is followed by smoke-free run-up to normal operation.

8.3 End Stop

8.3.1 End Stop Adjustment



- Move the acceleration lever (1) to the "Stop" position.
- Loosen the outer end stop eccentric (2) in advance.
- Screw in the stop screw (5) on the eccentric shaft (3) until contact is made with the regulating lever (6).
- Lock the stop screw with the nut (4).
- Turn the outer end stop eccentric (2) against the regulating lever until the latter is lifted about 1 mm from the stop position.
- Lock the eccentric screw.



Attention:



- The outer stop buffer eccentric prevents damage to the regulating rod assembly (critical for building on Bowden pull wires).

8.4 Injection pump - Setting Values - End of Delivery

Engine type	Flywheel		End of delivery (mm) before TDC - Tolerance + - 2mm at engine speed (min ⁻¹)							
	Part Number	Dia- meter mm	1500	1800	2000	2500	2800	3000	3300	3600
37E	738.265.4	310								
	738.293.4		21	24	26	32	35	37	*	*
	738.307.4	350								
	738.266.4		24	27	29	36	40	42	*	*
	738.294.4	375								
	738.268.4		26	29	32	39	42	45	*	*
	738.295.4									
43E	738.265.4	310								
	738.293.4		24	27	29	35	38	40	*	*
	738.307.4	350								
	738.266.4		27	31	33	37	43	45	*	*
	738.294.4	375								
	738.268.4		29	33	35	42	46	48	*	*
	738.295.4									
43F	738.265.4	310								
	738.293.4		*	*	*	34 ¹⁾	36 ¹⁾	39 ¹⁾	*	*
	738.307.4	350								
	738.266.4		*	*	*	38 ¹⁾	41 ¹⁾	44 ¹⁾	*	*
	738.294.4									

1) = ±1°

9. Tightening Torques for Screwed Connections

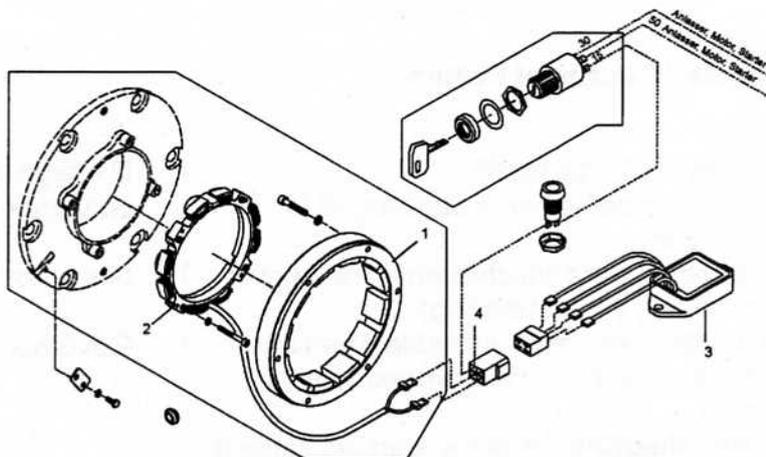
	37E/43E			43F		
	Wrench width (mm)	Tightening Torque (Nm)		Wrench width (mm)	Tightening Torque (Nm)	
		min	max		min	max
Rocker bracket	17	42	46	*	*	*
Cylinder head nuts	17	52	56	15	52	56
Connecting rod nuts	17	58	62	17	58	62
Valve cover nuts	17	44	48	*	*	*
Valve cover bolts	*	*	*	5	16	20
Bearing cover nuts	17	42	46	17	42	46
Injection pump nuts	13	20	23	13	20	23
Injection pump pressure valve bracket	14	34	39	14	34	39
Fuel pressure pipe - union nut - injection pump	17	18	22	17	18	22
Fuel pressure pipe - union nut - nozzle holder	17	25	30	17	25	30
Nuts for nozzle holder fixture	13	20	23	10	10	12
Governor	14	55	60	14	55	60
Flywheel nut	46	390	410	46	390	410
Flanged bearing screws	6	20	23	6	20	23
Tappet guide screws	6	20	23	6	20	23
Foot bearing screws	6	20	23	6	20	23
Lubricating oil pump screws	5	10	12	5	10	12
Hatch cover	6	20	23	6	20	23
Hollow bolt on injection pump	17	25	35	17	25	35
Hollow bolt on nozzle holder	11	8	10	11	8	10
Hollow bolt on tank	12	8	10	12	8	10
Oil filter	Finger-tighten only!					

10. Electrical System

10.1 Flywheel - Dynamo / Governor

Operation:

The permanent magnets in the magnet holder (1) on the flywheel side induce an alternating voltage in the coils of the stator (2): this voltage is proportional to speed (RPMs). The alternating voltage is rectified in the governor (3) and continuously regulated to approximately 14.2 - 14.5 V.



Connections to the Governor:

- 2x yellow | Generator coils, input, interchangeable
- 1x red | Output, charging current
- 1x brown | Charge control, Terminal 15, ignition lock

Connection to earth is made via the assembly surface.

Function Tests:

a) Alternating voltage at the coil output

Disconnect the connecting plug (4).

The voltage proportional to speed is measured on the two phases (2x black).

Set values: Graph A, "Idling Voltage without Governor Cut-Out"

b) Coils = single phase to earth

c) Charging current, governor output

Connect a suitable ammeter ($I_{max}=30A$) into the charging circuit (red cable).

The charging current depends on the speed and the state of the battery charge. Graph B, "Charging Current".

d) Charge control circuit

If the electrical system is intact, the charge control indicator must go out in the speed range from 600-800 revolutions/min.

Operating Conditions:

- Permissible operating temperatures: -20 to 70°C (measured on the governor surface)
- An intact earth connection must exist between the governor and the engine, and also between the governor and directly attached external construction (no painted or enamelled assembly surfaces).

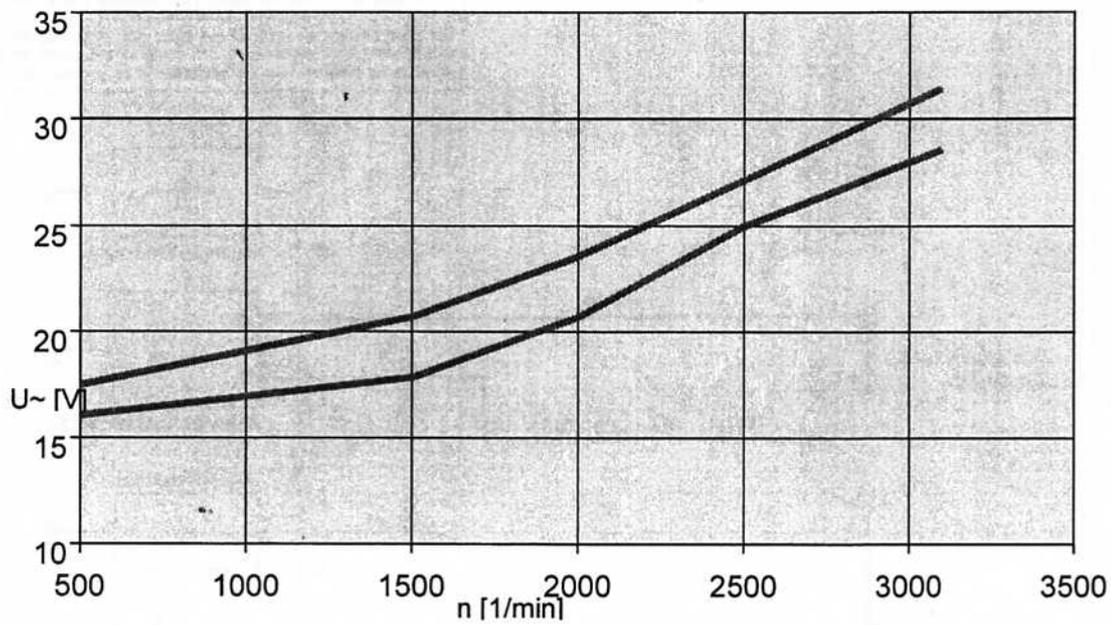
Hazards / Causes of Failure

Battery wrongly poled		Damage to charging control circuit
Battery is defective or discharged to minimum		Governor is destroyed in a short time.
Battery is disconnected while the engine is running (load shedding)		Governor is destroyed in a short time.
Charging with start aid cable when battery is defective or discharged to minimum		Governor is destroyed in a short time.
Load shedding when the start aid cable is removed.		
Welding work on the equipment (loosen all plug connections and battery cables beforehand)		Governor is destroyed in a short time.
Manual start with battery disconnected		Governor is destroyed in a short time.
Interruption of the earth connection between the governor housing and the engine		Governor is destroyed over a long period.

10.2 Flywheel - Dynamo 12V / Governor / Graph

Idling Voltage without Governor

Graph A



Charging Current

Graph B

