

REPAIR MANUAL

Diesel Engines **37E**
43E/F



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We congratulate you on your choice of a **FARYMANN** engine and wish you much pleasure with this German quality product.

These operating instructions are based on the latest state of technical development. In preparing them, every effort has been made to avoid errors. However, we accept no liability for any errors of presentation or description, nor for any omissions. Modifications may also occur because of ongoing technical developments. We reserve the right to make modifications without giving prior notice.

Everyone responsible for the installation, commissioning, operation, maintenance or repair of the engines must read and follow the operating instructions and particularly the "**Safety**" chapter.

The engine is built according to the state-of-the-art, and in compliance with recognised safety regulations. Nevertheless, while the engine is in use, there may be physical or mortal dangers to the user or to third parties, and also damage to the engine and to other property. For these reasons, the engine must only be used when it is in perfect technical condition, and when those involved are aware of the dangers and the safety precautions. In particular, malfunctions which could impair safety must be rectified immediately. The engine must only be used as intended. **FARYMANN DIESEL GmbH** is not responsible for damage resulting from incorrect use. Such risk is borne solely by the user.

Correct use also includes following the operating instructions and adhering to the operating, servicing and maintenance conditions. The engine must only be operated and serviced by reliable, trained personnel in compliance with the relevant accident prevention regulations as well as other generally-recognised rules of safety and occupational health.

FARYMANN DIESEL GmbH accepts no liability for any damage resulting from unauthorised conversions or modifications to the engine. Replacement parts must meet the technical requirements specified by **FARYMANN DIESEL GmbH**. This is always guaranteed if original replacement parts are used. Fitting and/or using parts and accessories not supplied by **FARYMANN DIESEL GmbH** may have a detrimental effect on your engine under certain circumstances.

FARYMANN DIESEL GmbH accepts no liability whatsoever for any damage resulting from the use of non-original replacement parts or accessories.

1. General Information, Handling

All **FARYMANN DIESEL** engines are 4 stroke, direct injection diesel engines. They are built as single cylinder engines in vertical and horizontal cylinder configuration. The direct injection guarantees an outstanding level of efficiency, with low fuel consumption and excellent cold starting behaviour. Bosch fuel injection equipment is used on all engines. A precision centrifugal governor ensures accurate speed (RPMs) and load regulation. For air cooling, a noise-optimised, maintenance-free flywheel fan circulates the cooling air through the cooling fins on the cylinder and the cylinder head.

1.1 Organisation and Use of this Repair Manual

The descriptions, data and illustrations refer to those assembly and adjustment procedures where **FARYMANN** engines differ from ordinary diesel engines.

Well-known procedures (such as how to set the start of delivery) are not described in detail.

- It is assumed that all work on the engine will be carried out by competent staff who have received training.
- Special tools must be available, as described in the manual, together with good-quality standard tools.

1.2 Service

- If you have any further questions about the Repair Manual, we recommend you to contact your nearest **FARYMANN** Service Centre.
- Circular letters and training courses ensure that our service personnel have an answer to every question. Please ask for a list of all our service locations from your own **FARYMANN** Service Centre.

1.3 After Sales - Service: FALKE - Spare Parts Program

"Service, Quality and Progress"

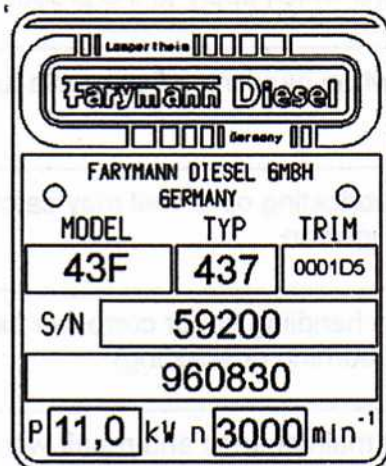
is our motto. This is why we have developed our very own computer-aided "FALKE" Service System.

The FALKE System makes it possible for **FARYMANN**'s world-wide network of distributors to **satisfy all spare parts and service requirements quickly and reliably, ensuring that we maintain a close relationship with our customers.**

1.4 Engine, Model and Type Designation

Every engine can be unmistakably identified using the manufacturer's nameplate. As well as the clearly defined 12-digit code number, this refers to the order number (SN) and the date of construction. This information must always be provided when making any enquiries or complaints, etc.

As of July 1985, the consecutive engine number is also imprinted on the crankcase.

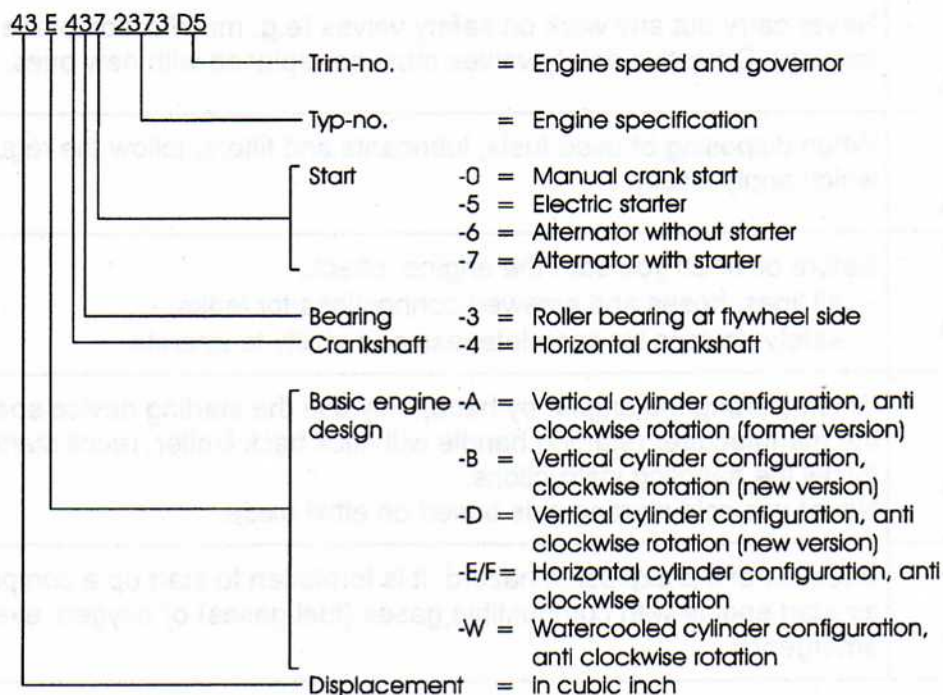


As of July 1982, the type designation (a 12-digit code number) is used in addition to the series number (SN = Order Number). (See manufacturer's nameplate).













e.g. **43E437 2373 D5**

95 03 20

Date of Production



1.5 Safety Instructions

	Only use transport devices specified by the manufacturer, and only follow hoisting instructions specified by the manufacturer.
	When handling fuels, lubricants and other chemical substances, follow the safety regulations which apply to the product.
	Do not smoke when handling inflammable fuels or lubricants.
	Vapours from lubricating oil or fuel may catch fire if they come into contact with sources of ignition.
	Be careful when handling hot or corrosive fuels, lubricants or other substances (risk of burning or scalding).
	Never carry out maintenance and repair work when the engine is running. Ensure that the engine cannot start unintentionally.
	Before turning the engine over, make sure that nobody is in the danger area. When you have finished working on the engine, always check that the safety devices have been refitted, and that all tools have been removed from the engine.
	Never carry out any work on safety valves (e.g. modification of the spring tension). Defective safety valves must be replaced with new ones.
	When disposing of used fuels, lubricants and filters, follow the regulations which apply locally.
	Before or when you start the engine, check: – all lines, hoses and screwed connections for leaks; – safety devices for completeness and ability to operate.
	When starting the engine by hand, only use the starting device specified by the manufacturer (starting handle with kick back limiter, recoil starting) and follow the handling instructions. Never use cold starting aids based on ethyl oxide.
	Because of the explosion hazard, it is forbidden to start up a compressed-air start engine with combustible gases (fuel gases) or oxygen, even in an emergency.

SAFETY INSTRUCTIONS

1.5 Safety Instructions



Only operate IC engines in enclosed areas if there is adequate ventilation. Before you start the engine in an enclosed environment, make sure that there is sufficient ventilation.



Ensure that the engine only slows down to full stop after 10 - 20 seconds!



If there are any safety devices on the engine, or on the machine into which the engine is built, they must be refitted when the maintenance and repair work has been finished.



Before starting any work on the electrical components, the power supply to all live parts must be cut off.



Only carry out maintenance and repair work when the engine parts are in a stable position.



Liquids ejected under high pressure (such as fuels or oils) may penetrate the skin and cause severe injuries.



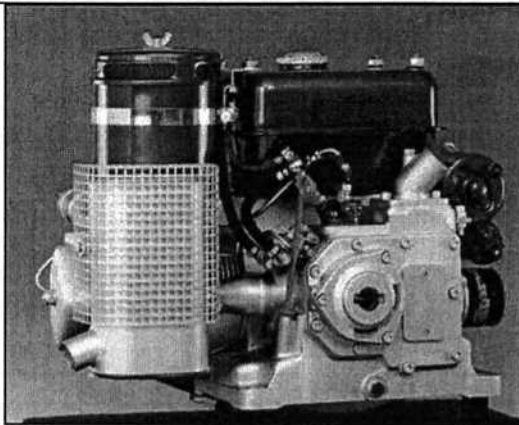
To carry out cleaning work on the engine, always use a non-combustible detergent, or one which has a flash point of more than 65 °C.

CALIFORNIA

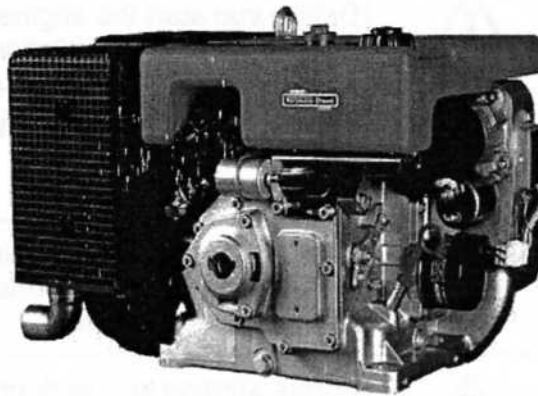
Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

2. Technical Data



37E / 43E-Engine



43F-Engine

Engine Type	37E	43E	43F
Design	horizontal		
Number of Cylinders	1		
Bore	95 mm Ø		
Stroke	100 mm		
Cubic capacity (piston displacement)	708 cm ³		
Direction of rotation (looking at power take-off side)	anti clockwise		
Max. power F (DIN 70020)	9,1 kW (12,4 HP)	10,6 kW (14,4 HP)	11,4 kW (15,5 HP)
IFN-ISO (DIN 6271)	8,3 kW (11,3 HP)	9,7 kW (13,2 HP)	11,0 kW (15,0 HP)
ICFN-ISO (DIN 6271)	7,5 kW (10,2 HP)	8,7 kW (11,8 HP)	9,9 kW (13,5 HP)
Max. torque (DIN 70020)	31 Nm at 2200 RPM	37 Nm at 2000 RPM	40,6 Nm at 2300 RPM
Max. speed	3000 RPM		
Mean piston speed	10 m/s at 3000 RPM		
Compression ratio	1 : 19		
Valve clearance, exhaust valve	0,1 mm		
intake valve	0,1 mm		
Tank capacity	8,3 l	8,3 l	7,5 l
Lubricating oil volume (sump capacity)	2,1 l		
Lubricating oil consumption	1,0 g/kWh		
Starter rated voltage	12 V		
battery capacity required	55Ah		
Weight	87 kg		
Overall dimensions (H * W * L)	approx. 500 mm * 440 mm * 590 mm		approx. 360mm * 430mm 580mm
Permissible tilt during operation :			
longitudinal	15 °		
lateral	15 °		

TECHNICAL DATA

2.1 Construction Data, Consumptions and Pressures

		Technical Data								Table 1			
Engine Type		37E				43E				43F			
Construction data	dimension	\											
System	*	four stroke											
Combustion Procedure	*	direct injection											
Cooling System	*	air-cooled											
Design / Configuration	*	1-cylinder / horizontal											
Bore	(mm)	95											
Stroke	(mm)	100											
Displacement	(cm ³)	708											
Compression Ratio	*	1 : 18,7 - 1 : 20,5				1 : 17.5 - 1 : 19,1				1 : 19 - 1 : 19,5			
Temperatures	dimension												
Permissible air intake temperature (max.)	(°C)	50											
Permissible exhaust gas temperature (max.)	(°C)	580											
Permissible cooling air temperature (max.)	(°C)	50											
Permissible fuel temperature (max.)	(°C)	80											
Permissible lub. oil temperature (max.)	(°C)	130											
Consumptions (at IFN Output)													
Specific fuel consumption	(g/kWh)	268	262	280	*	258	251	280	*	225	217	235	*
Fuel tank content	(l)	8,3								7,5			
Feed pump (max. lift)	(mm)	300											
Fuel	*	to DIN 51 601 / ASTM D 975-77 + 2D/BS 28669 1970 A1 + A2											
Specific lub. oil consumption	(g/kWh)	1											
max. lub. oil capacity	(g/l)	1860 / 2,1											
Topping up volume lower-upper mark	(g/l)	710 / 0,8											
Lub. oil quality	*	HD oil: minimum quality CC; better, CD quality (API-spec.) and multigrade oils											
Pressures													
Injector setting	(bar)	175								250			
Oil pressure (max.)	(bar)	5											
Permissible air intake vacuum	(kPa)	2											
Permissible exhaust gas back pressure	(kPa)	5											

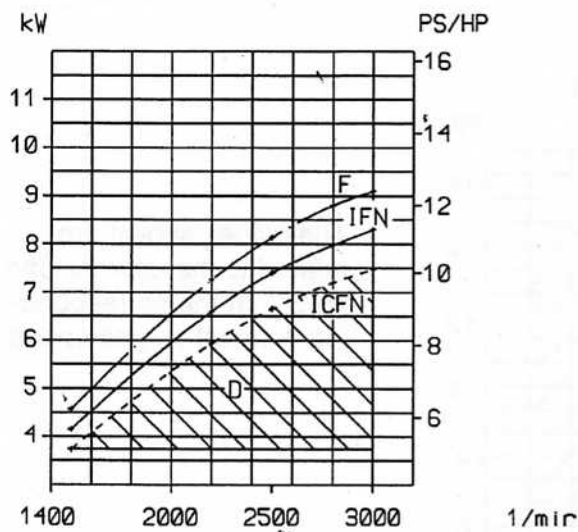
TECHNICAL DATA

2.1 Construction Data, Consumptions and Pressures

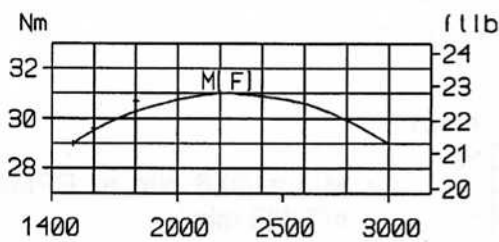
		Technical Data								Table 2			
Engine Type		37E				43E				43F			
Adjustment Data													
Valves													
Inlet opens BTDC	*	38°-42° = 103 - 114 mm				38°-42° = 103 - 114 mm				40°-55° = 108 - 149 mm			
Exhaust closes ATDC	*	50°-55° = 135 - 148 mm				50°-55° = 135 - 148 mm				55°-60° = 149 - 162 mm			
Flywheel diameter	(mm)	310											
Injection pump: end of delivery, plunger with control edge "above"													
Engine RPMs	(min ⁻¹)	1500	1800	2000	2400	1500	1800	2000	2400	1500	1800	2000	2400
End of delivery BTDC	(mm)	21	24	26	30	24	27	29	33	*	*	*	*
Engine RPMs	(min ⁻¹)	2500	2800	3000	3600	2500	2800	3000	3600	2500	2800	3000	3600
End of delivery BTDC	(mm)	32	35	37	*	35	38	40	*	34	36	39	*
Injection pump: start of delivery, plunger with control edge "below" (engines for generator and pump drive)													
Engine RPMs	(min ⁻¹)	1500	1800	3000	*	1500	1800	3000	*	*	*	*	*
Start of delivery BTDC	(mm)	*	*	*	*	*	*	*	*	*	*	*	*
Valve clearance (cold) inlet and outlet valve	(mm)	0,1											
Repair Data	Dimension												
Inlet valve recedes by:	(mm)	0 - 0,1				0 - 0,1				2,5 - 2,6			
Exhaust valve recedes by:	(mm)	0 - 0,1				0 - 0,1				2,5 - 2,6			
Piston protrudes by:	(mm)	0,635 - 0,9				0,635 - 0,9				0,635 - 0,9			
Gap measurement	(mm)	0,55 - 0,865				0,55 - 0,865				0,55 - 0,865			
Piston ring joint	(mm)	0,4 - 1,0				0,4 - 1,0				0,4 - 1,0			
Crankshaft plain bearing clearance - new condition	(mm)	0,03 - 0,07				0,03 - 0,07				0,03 - 0,07			
Crankshaft plain bearing clearance - wear limit	(mm)	0,1				0,1				0,1			
Connecting rod plain bearing clearance - new condition	(mm)	0,03 - 0,07				0,03 - 0,07				0,03 - 0,07			
Connecting rod plain bearing clearance - wear limit	(mm)	0,13				0,13				0,13			
Crankshaft end play	(mm)	0,05 - 0,15				0,05 - 0,15				0,05 - 0,15			

2.2 Output, Torque, Consumption

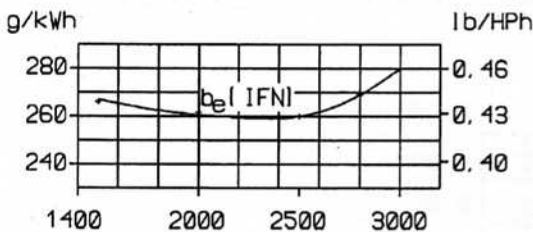
37E Leistung / Output / Puissance / Potencia



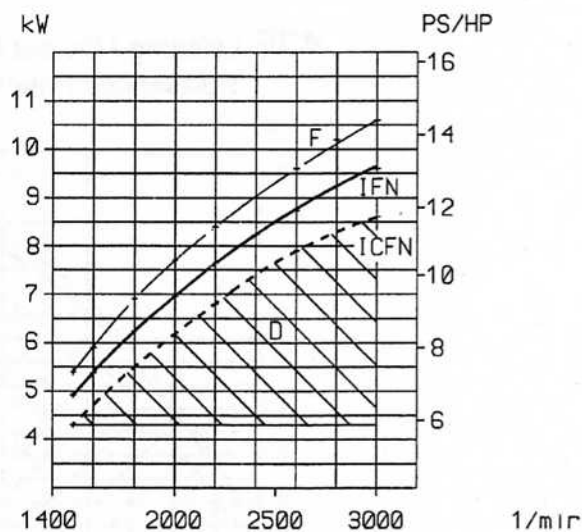
Drehmoment / Torque /
Couple / Par



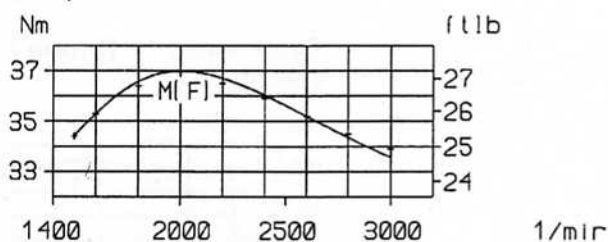
Verbrauch / Consumption /
Consommation / Consumo



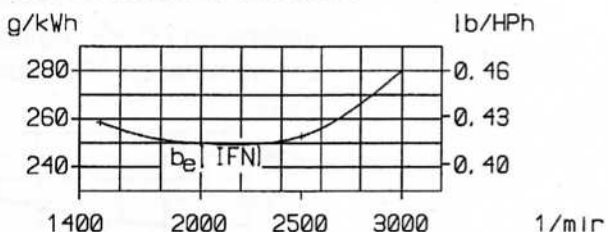
43E Leistung / Output / Puissance / Potencia



Drehmoment / Torque /
Couple / Par



Verbrauch / Consumption /
Consommation / Consumo

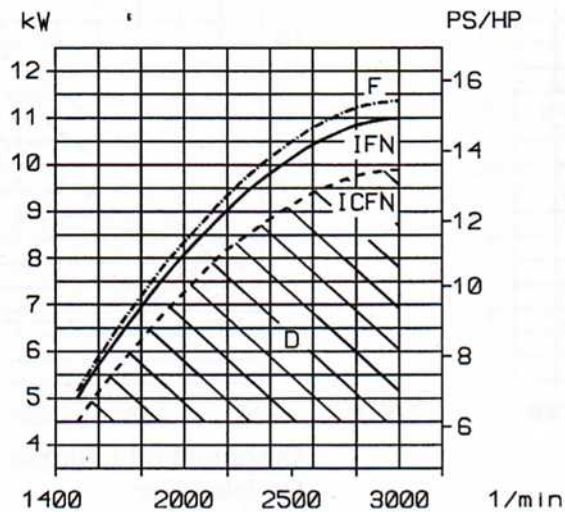


DIN ratings

- F Vehicle rating: intermittent duty at variable speed and load.
- IFN-ISO DIN-ISO 3046 Blocked useful performance for intermittent loads.
- ICFN-ISO DIN-ISO 3046 Standard performance, blocked continuous useful performance for constant RPMs and constant load.
- D Continuous operation: - contact factory for use beyond the limits indicated.
- Decrease of approx. 1% for every 100 m altitude and approx. 2% for every 5°C above 20°C
- Rating certified within tolerance of 5% after engine has been run in with standard air filter and exhaust muffler.

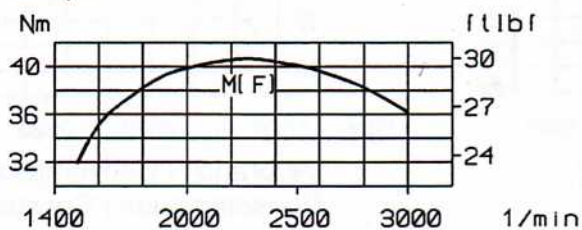
2.2 Output, Torque, Consumption

43F Leistung / Output / Puissance / Potencia



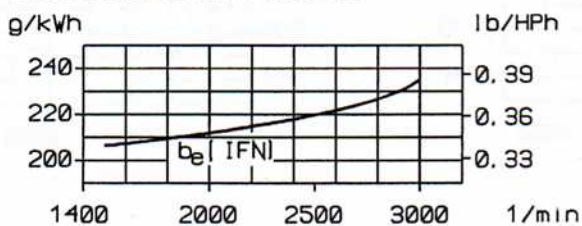
The values shown are related to the optimal load setting at the corresponding nominal engine speed.

Drehmoment / Torque / Couple / Par



$M_{\max} = 40,6 \text{ Nm}$ at RPMs of 2300 min^{-1} .

Verbrauch / Consumption / Consommation / Consumo

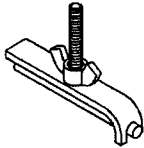
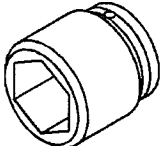
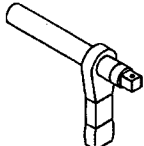
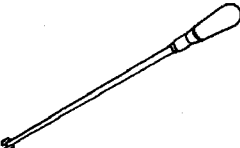
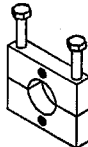
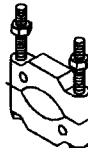

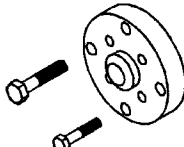
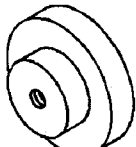


2.3 Screws - Tightening Torques, Sealing and Adhesive Materials

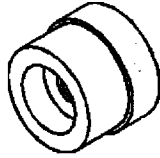
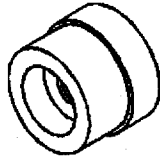
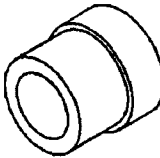
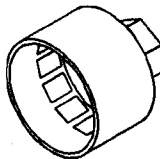
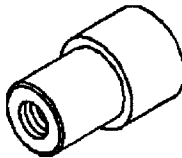
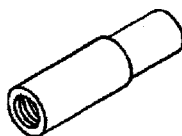
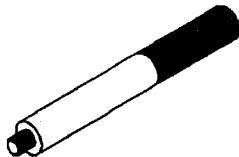
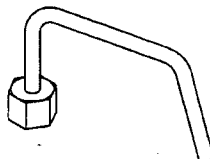
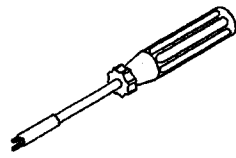
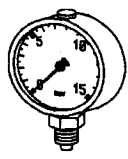
		Technical data		Table 1
Engine type		37E	43E	43F
Tightening torques				
Cylinder head torque / wrench width	(Nm) (mm)	52 - 56 / 17	52 - 56 / 17	52 - 56 / 17
Rocker bracket torque / wrench width	(Nm) (mm)	42 - 46 / 17	42 - 46 / 17	*
Bearing cover torque / wrench width	(Nm) (mm)	42 - 46 / 17	42 - 46 / 17	42 - 46 / 17
Connecting rod torque / wrench width	(Nm) (mm)	58 - 62 / 17	58 - 62 / 17	58 - 62 / 17
Nozzle holder torque / wrench width	(Nm) (mm)	20 - 23 / 13	20 - 23 / 13	20 - 23 / 13
Injection pump torque / wrench width	(Nm) (mm)	20 - 23 / 13	20 - 23 / 13	20 - 23 / 13
Delivery valve torque / wrench width	(Nm) (mm)	34 - 39 / 22	34 - 39 / 22	34 - 39 / 22
Flywheel torque / wrench width	(Nm) (mm)	390 - 410 / 46	390 - 410 / 46	390 - 410 / 46
Oil filter plate torque / wrench width	(Nm) (mm)	20 - 23 / Inbus	20 - 23 / Inbus	20 - 23 / Inbus
Maximum operation angles				
Longitudinal (in dir. of crankshaft)	(deg.)	15	15	15
Transverse	(deg.)	15	15	15
Sealing and adhesive materials				
Text Code		Type		
A		Loctite 573		
B		Loctite 270		
C		Loctite 415		

SPECIAL TOOLS

3. Tools

Part No.	Description	Use	
748.115.6	Fuel line clamp	to clamp fuel supply lines	
748.154.2	Hexagonal socket wrench, 46 mm	for flywheel nuts	
748.128.4	Drive wrench	for use with socket wrench, 748.154.2	
748.108.5	Special screw driver	to adjust governor spring nuts	
748.132.6	Crankshaft race puller	use with part no. 748.136.2 to pull off main bearing race from crankshaft	
748.137.2	Crankshaft gear wheel puller	use with part 748.136.2 to pull off crankshaft gear wheel	
748.136.2	Puller plate	use with parts 748.132.6 and 748.137.2	
748.122.6	Flywheel puller	to loosen flywheel	
748.119.4	Bearing driver	to press in crankshaft roller bearing and shaft seal	

SPECIAL TOOLS

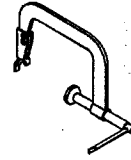
748.120.4	Bearing driver	to press the crankshaft bearing bushes in and out	
748.121.4	Bearing driver	to press the camshaft in and out	
748.124.4	Bearing driver	to press out the crankshaft roller bearing	
748.173.2	Oil filter wrench	to remove the full flow oil filter	
748.172.4	Bearing driver	to press the little end bearing bush in and out (connecting rod)	
748.129.4	Bearing driver	to press the regulator shaft bearing bush in and out	
37E/43E: 748.125.4 43F: 748.211.4	Guide punch	to press the valve guides in and out	
748.097.6	Drop tube	to measure the injection timing	
748.192.4	Slotted screw driver	to set the adjustment	
748.126.2	Oil pressure gauge	to measure the oil pressure	

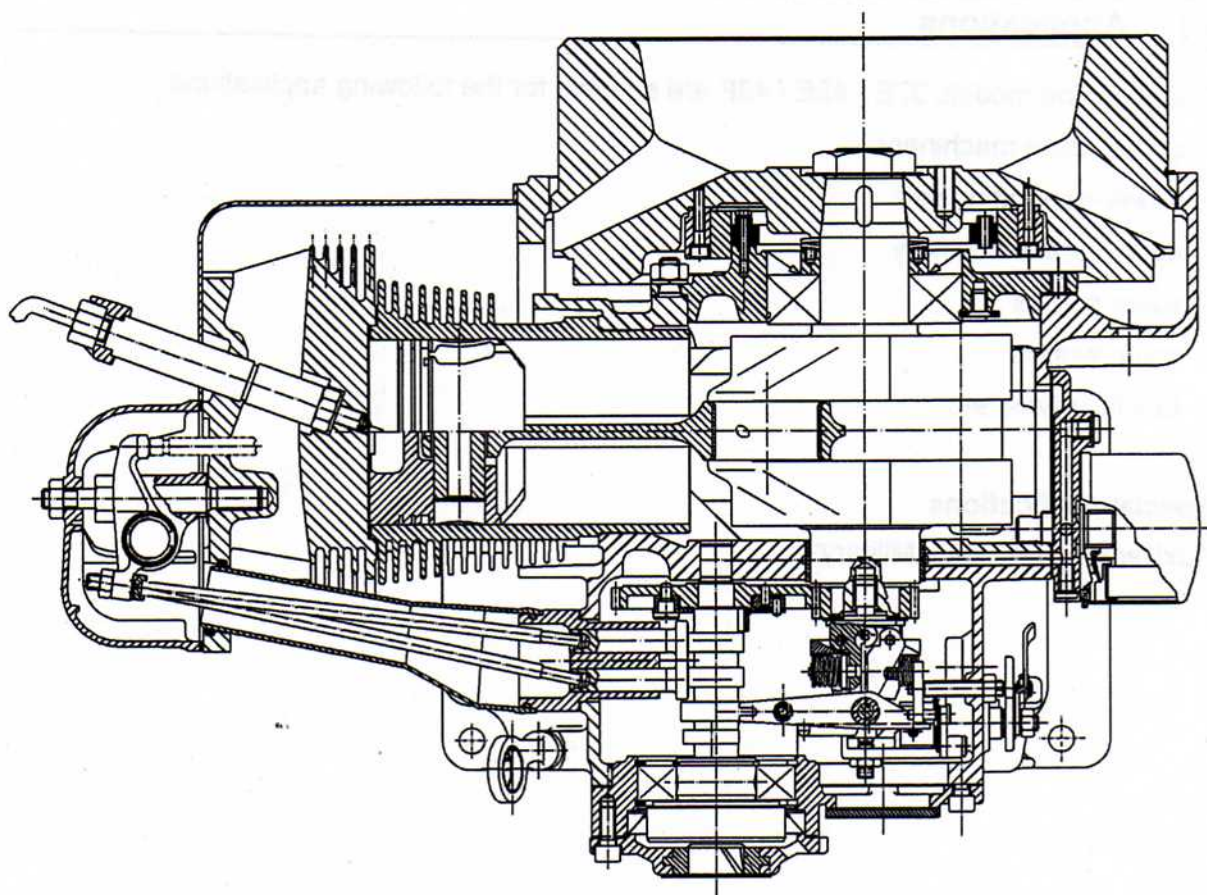
SPECIAL TOOLS

748.131.5

Valve spring lifter

to remove and fit the
valve springs





Presentation : 43E – engine

4. Technical Description

Diesel engine models 37E / 43E/ 43F are horizontal, air-cooled, single-cylinder, four-stroke diesel engines with direct injection. The engines have oil pressure forced lubrication. The fuel injection pump and the valves are controlled by the camshaft which is driven by the crankshaft. The fuel injection pump (self-venting fuel system) is driven directly while the valves are driven by push rods and rockers. An electric starter and a manual starting device are provided to start the engine. The engines are equipped with a fully automatic decompression system and a fully automatic starting enrichment quantity. Models 37E / 43E are available with a dry type air filter or an oilbath air filter.

43F – engines meet 2000 U.S. EPA – Limits and U.S. MSHA – exhaust-emission-regulations.

4.1 Applications

Diesel engine models 37E / 43E / 43F are suitable for the following applications:

- construction machinery
- power-generating sets
- agricultural machinery
- water pumps
- compressors
- fork lift drives, etc.

Special applications

Auxiliary Power Units, Military