

# REPAIR MANUAL

**DIESEL ENGINES : 15 / 18 / 32W**



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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.

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## 1. General Information, Handling

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**FARYMANN DIESEL** engines type 15/18/32W are 4 stroke, direct injection diesel engines. They are built as single cylinder engines vertical 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 high-precision centrifugal governor ensures accurate speed (RPMs) and load control.

Special modified water-cooled Farymann engines fulfill BSO I/II and EPA – requirements.

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## 1.3 Organisation and Use of this Repair Manual

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

- 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.

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## 1.4 Service

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- 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.

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## 1.5 After Sales - Service: FALKE - Spare Parts Program

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### "Service, Quality and Progress"

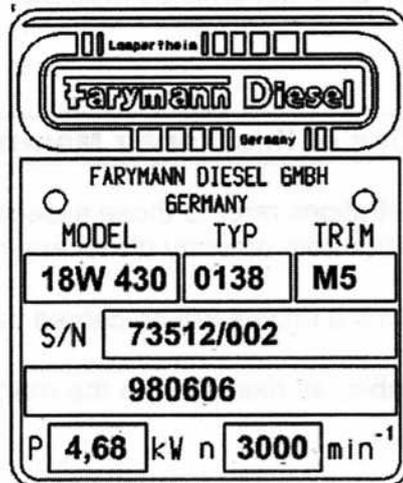
is our motto. This is why we have developed our very own computer-aided "FALKE" Service System.

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.**

## 1.6 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.

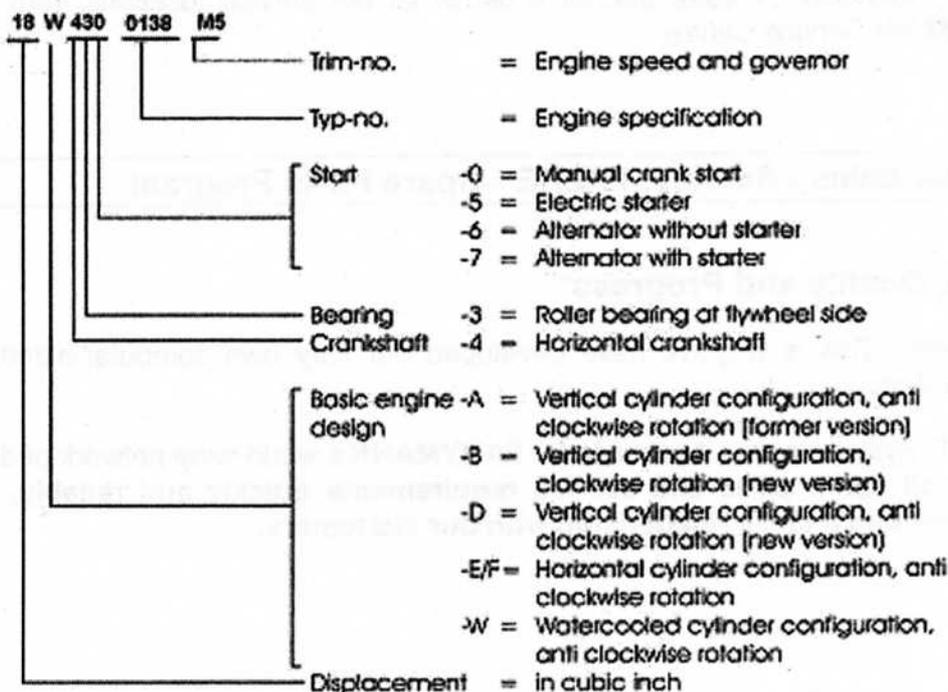


As of July 1982, the type designation (a 12-digit code number) is used in addition to the series number (SN = Order Number). (See manufacturer's nameplate).

e.g. **18W430.0138 M5**

**98 06 06**

**Date of Production**



**1.7 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.

# GENERAL INFORMATION

## 1.5 Safety Instructions

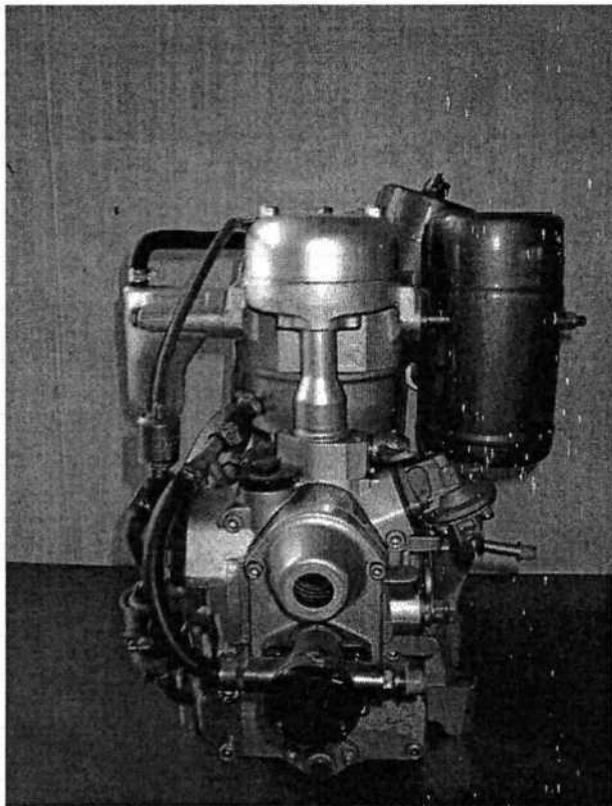
	Only operate IC engines in enclosed areas if there is adequate ventilation. Before you start the engine in an enclosed environment, make sure that there is sufficient ventilation.
	Ensure that the engine only slows down to full stop after 10 - 20 seconds!
	If there are any safety devices on the engine, 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



Engine Type	15W	18W	32W
Design	vertical		
Number of Cylinders	1		
Bore	75 mm	82 mm	95 mm
Stroke	55 mm	55 mm	74 mm
Cubic capacity (piston displacement)	242 cm <sup>3</sup>	290 cm <sup>3</sup>	524 cm <sup>3</sup>
Direction of rotation (looking at power take-off side)	anti clockwise		
Max. power / 3000 RPM			
F (DIN 70020)	4,76 kW	5,70 kW	9,74 kW
IFN-ISO (DIN 6271)	4,33 kW	5,20 kW	8,85 kW
ICFN-ISO (DIN 6271)	3,90 kW	4,70 kW	8,00 kW
Max. torque (DIN 70020)	14,4 Nm at 2400 RPM	16,7 Nm at 2400 RPM	30,2 Nm at 2400 RPM
Max. speed	3600 RPM		
Mean piston speed at 3000 RPM	5,5 m/s	5,5 m/s	7,4 m/s
Compression ratio	1 : 20	1 : 19,1 – 22,6	1 : 20
Valve clearance, exhaust valve	0,2 mm		
intake valve	0,2 mm		
Tank capacity	---	---	---
Lubricating oil volume (sump capacity)	1,0 l	1,0 l	1,6 l
Lubricating oil consumption	1,0 g/kWh		
Starter motor rated voltage	12 V		
Battery capacity required	55Ah		
Weight	37 kg	37 kg	75 kg
Cooling water requirement	7 – 8 l/min		
Permissible tilt during operation :			
Longitudinal	15 °		
Lateral	15 °		

# TECHNICAL DATA

## 2.1 Construction Data, Consumptions and Pressures

		Technical Data		Table 1
Engine Type		15W	18W	32W
Construction data	dimension			
System	*	four stroke		
Combustion Procedure	*	direct injection		
Cooling System	*	Water-cooled		
Design / Configuration	*	1-cylinder / vertical		
Bore	(mm)	75	82	95
Stroke	(mm)	55	55	74
Displacement	(cm <sup>3</sup> )	242	290	524
Compression Ratio	*	1 : 20,0	1 : 19.1 - 1 : 22,6	1 : 20,0
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		
<b>Consumptions (at IFN Output)</b>				
Specific fuel consumption, 3000 RPM	(g/kWh)	305	300	255
Fuel tank content	(l)	NO		
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)	1100 / 1,25	1100 / 1,25	1380 / 1,56
Topping up volume lower-upper mark	(g/l)	200 / 0,226	200 / 0,226	240 / 0,270
Lub. Oil quality	*	HD oil: minimum quality CC; better, CD quality (API-spec.) and multigrade oils		
<b>Pressures</b>				
Injector setting	(bar)	200	200	175
Oil pressure (max.)	(bar)	5		
Permissible air intake pressure	(kPa)	2		
Permissible exhaust gas back pressure	(kPa)	5		

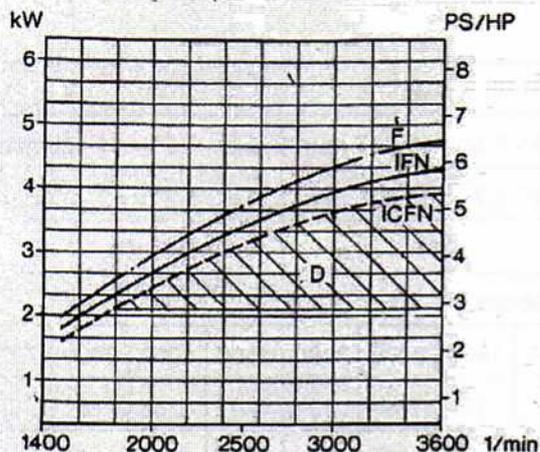
# TECHNICAL DATA

## 2.1 Construction Data, Consumptions and Pressures

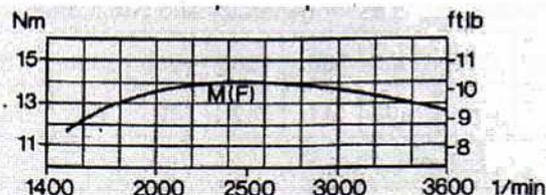
		Technical Data												Table 2
Engine Type		15W				18W				32W				
Adjustment Data														
Valves, Inlet / Outlet	(mm)	0,2 all												
Inlet opens BTDC	*	5,3° - 7,5° = 12 - 17 mm				5,3° - 7,5° = 12 - 17 mm				5,2° - 7,5° = 14 - 20 mm				
Exhaust closes ATDC	*	4,4° - 6,7° = 10 - 15 mm				4,4° - 6,7° = 10 - 15 mm				4,5° - 6,7° = 12 - 18 mm				
Flywheel diameter	(mm)	258				258				308				
Injection pump: end of delivery, plunger with control edge "above"														
Engine RPMs	(min <sup>-1</sup> )	1500	1800	2000	2500	1500	1800	2000	2500	1500	1800	2000	2500	
End of delivery BTDC	(mm)		17	18	19		17	18	19	28	28	28	32	
Engine RPMs	(min <sup>-1</sup> )	2800	3000	3300	3600	2800	3000	3300	3600		3000	3300	3600	
End of delivery BTDC	(mm)	21	22	25	28	21	22	25	28	36	40	40	46	
Injection pump: start of delivery, plunger with control edge "below" (engines for generator and pump drive)														
Engine RPMs	(min <sup>-1</sup> )	1500	1800	3000	3600	1500	1800	3000	3600	1500	1800	3000	3600	
Start of delivery BTDC	(mm)	*	*	39	41	*	*	39	41	42	42	60	73	
Valve clearance (cold) inlet and outlet valve	(mm)	0,2												
Repair Data														
Inlet valve Recedes by:	(mm)	0,1 - 0,2				0,1 - 0,2				0,1 - 0,2				
Exhaust valve Recedes by:	(mm)	0,1 - 0,2				0,1 - 0,2				0,1 - 0,2				
Piston protrudes by:	(mm)	0,63 - 0,93				0,63 - 0,93				0,65 - 0,98				
Gap measurement	(mm)	0,47 - 0,82				0,47 - 0,82				0,43 - 0,85				
Piston ring joint	(mm)	0,2 - 0,8				0,2 - 0,8				0,2 - 0,8				
Crankshaft plain bearing clearance - new condition	(mm)	0,02 - 0,05				0,02 - 0,05				0,02 - 0,06				
Crankshaft plain bearing clearance - wear limit	(mm)	0,08				0,08				0,09				
Connecting rod plain bearing clearance - new condition	(mm)	0,03 - 0,06				0,03 - 0,06				0,03 - 0,08				
Connecting rod plain bearing clearance - wear limit	(mm)	0,11				0,11				0,12				
Crankshaft end play	(mm)	0,05 - 0,15				0,05 - 0,15				0,05 - 0,15				

## 2.2 Output, Torque, Consumption

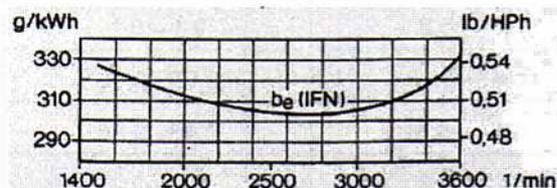
### 15W Leistung / Output / Puissance / Potencia



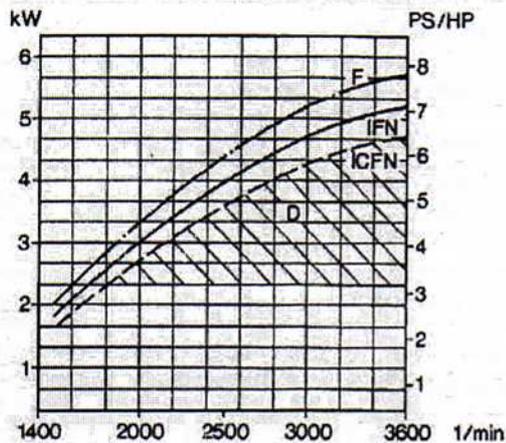
### Drehmoment / Torque / Couple / Par



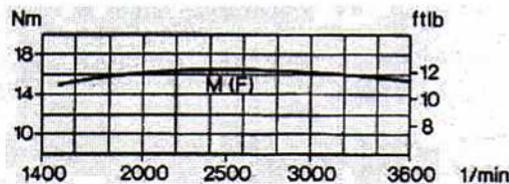
### Verbrauch / Consumption / Consommation / Consumo



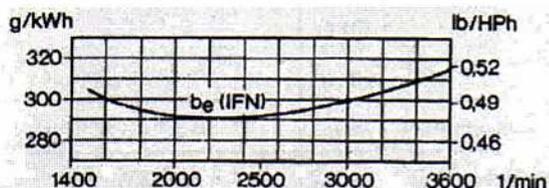
### 18W Leistung / Output / Puissance / Potencia



### Drehmoment / Torque / Couple / Par



### Verbrauch / Consumption / Consommation / Consumo



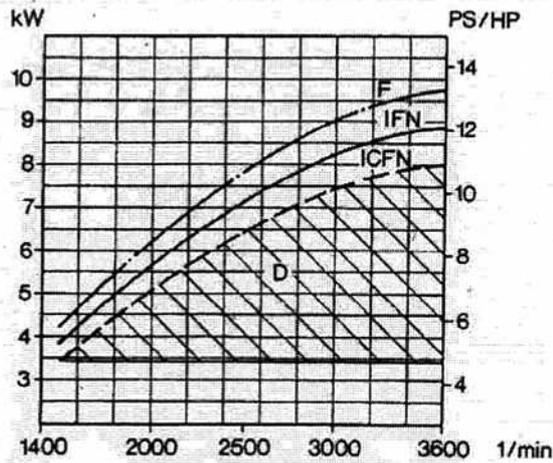
### DIN ratings

- 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.

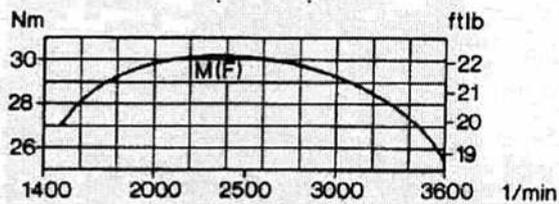
## 2.2 Output, Torque, Consumption

**32W** Leistung / Output /  
Puissance / Potencia

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

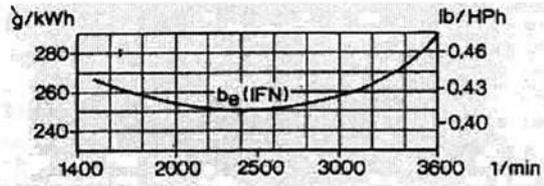


Drehmoment / Torque /  
Couple / Par



# TECHNICAL DATA

Verbrauch / Consumption /  
Consumption / Consumo



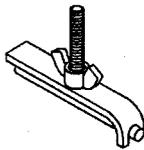
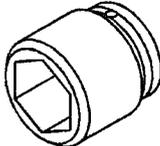
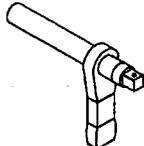
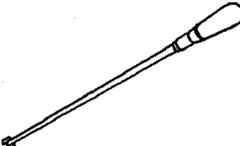
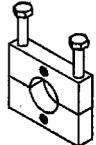
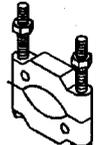
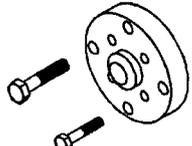
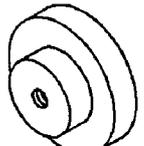
# TECHNICAL DATA

## 2.3 Screws - Tightening Torques, Sealing and Adhesive Materials

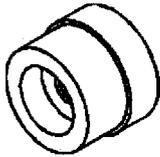
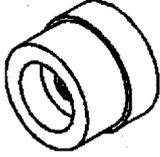
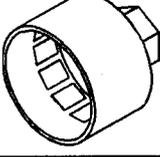
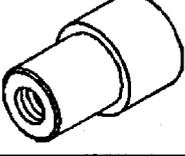
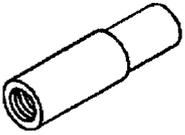
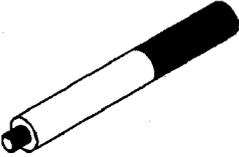
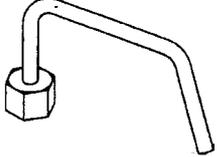
		Technical data		Table 1
Engine type		15W	18W	32W
<b>Tightening torques</b>				
Cylinder head torque / wrench width	(Nm) (mm)	30 - 33 / 13	30 - 33 / 13	52 - 56 / 17
Rocker bracket torque / wrench width	(Nm) (mm)	*	*	*
Bearing cover torque / wrench width	(Nm) (mm)	30 - 33 / 13	30 - 33 / 13	30 - 33 / 13
Connecting rod torque / wrench width	(Nm) (mm)	30 - 33 / 13	30 - 33 / 13	52 - 56 / 17
Nozzle holder torque / wrench width	(Nm) (mm)	20 - 23 / 13	20 - 23 / 13	20 - 23 / 13
Injection pump torque / wrench width	(Nm) (mm)	8 - 12 / 10	8 - 12 / 10	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)	8 - 12 / 10	8 - 12 / 10	390 - 410 / 46
Speed governor torque / wrench width	(Nm) (mm)	55 - 60 / 14	55 - 60 / 14	55 - 60 / 14
<b>Maximum operation angles</b>				
Longitudinal (in dir. of crankshaft)	(deg.)	15	15	15
Transverse	(deg.)	15	15	15
<b>Sealing and adhesive materials</b>				
<b>Text Code</b>		<b>Type</b>		
A		Loctite 573		
B		Loctite 270		
C		Loctite 415		

# TECHNICAL DATA

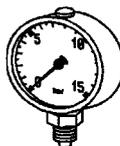
## 2.4 Tools

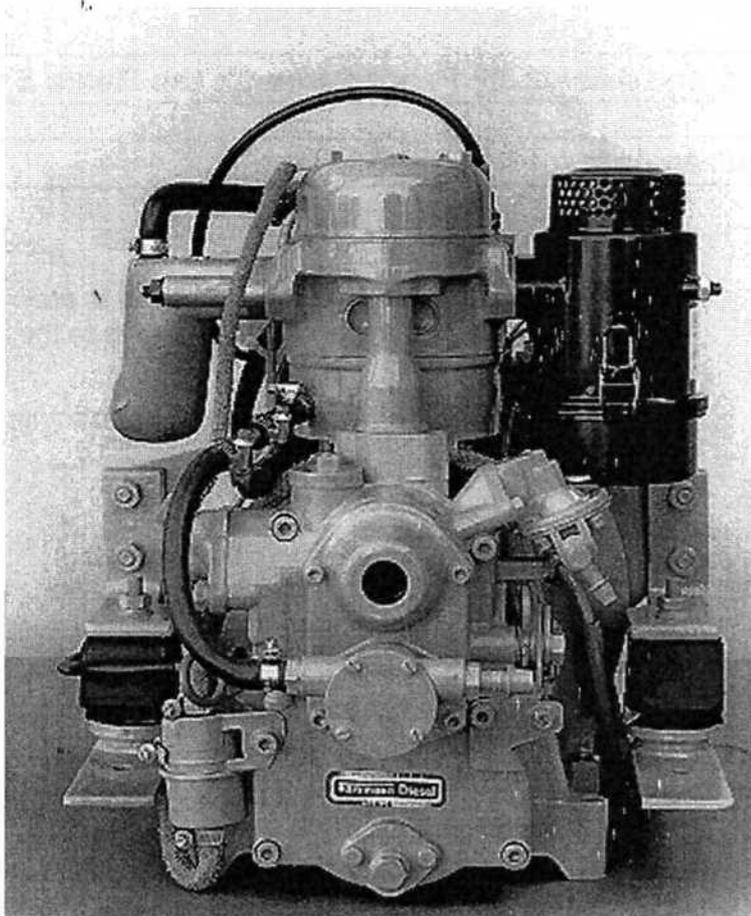
Part No.	Description	Use	
748.115.6	Fuel line clamp	to clamp fuel supply lines	
748.130.2	Hexagonal socket wrench, 36 mm	for flywheel nuts	
748.128.4	Drive wrench	for use with socket wrench, 748.154.2	
748.108.5	Special screw driver	to adjust governor spring nuts	
748.132.6	Crankshaft race puller	use 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	

2.4 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	
748.117.6	Drop tube	to measure the injection timing	

2.4 Tools

748.126.2	Oil pressure gauge	to measure the oil pressure	
748.131.5	Valve spring lifter	to remove and fit the valve springs	



## 2.5 Technical Description

Diesel engine models 15W / 18W / 32W are water-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 an automatic decompression system and a manual forced starting enrichment quantity. Special modified water-cooled Farymann engines fulfill BSO I/II and EPA – requirements.

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## 2.6 Applications

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Diesel engine models 15W / 18W / 32W are suitable for the following applications:

- Marine generating sets
- Marine propulsion engines
- Vehicle cooling systems
- Military Equip. ( APU, ... )
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