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June 1997

**SABB**  
**IVECO *aifo***

## Operators Handbook

FOR

TYPE 8041M08-LB

TYPE 8061M12-LB

LIFEBOAT ENGINE

SABB MOTOR A.S

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CONTENTS: . . . . .	PAGE
GENERAL PRECAUTIONS . . . . .	1
INTRODUCTION . . . . .	2
STARBOARD/PORTSIDE VIEWS. TYPE 8041 M08-LB . . . . .	3
STARBOARD/PORTSIDE VIEWS. TYPE 8061 M12-LB . . . . .	4
ENGINE SPECIFICATION 8041 M08 - LB . . . . .	5
ENGINE SPECIFICATION 8061 M12 - LB . . . . .	5
TIMING . . . . .	6
FUEL SYSTEM . . . . .	6
LUBRICATION . . . . .	6
COOLING SYSTEM, WITH HEAT EXCHANGER . . . . .	7
COOLING SYSTEM WITH KEEL COOLING . . . . .	7
ANTI-FREEZE . . . . .	7
GEARBOX . . . . .	8
ELECTRIC SYSTEM . . . . .	8
ENGINE BLOCK HEATER . . . . .	8
WIRING DIA., INSTR.PANEL SIDE/DESCRIPTION 8041M08-LB . . . . .	9-10
WIRING DIA., ENGINE SIDE/DESCRIPTION 8041M08-LB . . . . .	11-12A-B-C
WIRING DIA., INSTR.PANEL SIDE/DESCRIPTION 8061M12-LB . . . . .	12-12A
WIRING DIA., ENGINE SIDE/DESCRIPTION 8061M12-LB . . . . .	12B-12C
INSTRUMENT PANEL AND OPERATING CONTROLS . . . . .	13
BATTERY MAIN SWITCH . . . . .	13
TYPICAL LEVER CONTROL BOX FOR GEARBOX/SPEED CONTROL . . . . .	13
STARTING PRECAUTIONS . . . . .	14
CHECKS BEFORE STARTING . . . . .	14
STARTING . . . . .	14
STARTING AND RUNNING LB.ENGINES WHILE HOOKED IN DAVITS . . . . .	15
OPERATION . . . . .	15

<b>CONTENTS :</b>	<b>PAGE</b>
STOP . . . . .	15
MAINTENANCE . . . . .	16
INITIAL ATTENTION. . . . .	16
ROUTINE MAINTENANCE PERIODES . . . . .	16
ENGINE OIL SPECIFICATION . . . . .	17
GEARBOX OIL SPECIFICATION . . . . .	17
STERN GLAND AND REMOTE CONTROL GREASE . . . . .	17
CHECK OF LUBRICATION OIL LEVEL . . . . .	18
LUBRICATION OIL CHANGE . . . . .	18
CHANGE OF OIL FILTER CARTRIDGE . . . . .	18
GEARBOX OIL CHECK AND CHANGE. . . . .	18
CHANGING FUEL OIL FILTER . . . . .	18
WATER SEPARATOR . . . . .	19
PRIMING THE FUEL SYSTEM . . . . .	19
CLEANING FUEL PUMP FILTER . . . . .	19
REFUELING. . . . .	20
CHECKING FRESH WATER LEVEL . . . . .	20
BLEEDING THE AIR FROM THE COOLING WATER CIRCUIT. . . . .	20
CHECKING DRIVE BELT TENSION AND CONDITIONS . . . . .	20
CHECK AND CHANGE OF ENGINE HEATER . . . . .	21
CHECK OF BATTERY . . . . .	22
GENERAL PRECAUTIONS REGARDING ELECTRIC SYSTEM . . . . .	22
CHECKING THE CONDITION OF THE SEA WATER PUMP . . . . .	23
CHECKING VALVE CLEARANCE. . . . .	23
CHECKING THE CONDITION OF THE FUEL INJECTORS. . . . .	23
VALVE REGRINDING AND CYLINDER HEAD BOLT TORQUE REQU . . . . .	24
TORQUE REQUIREMENTS FOR MAIN ENGINE COMPONENTS . . . . .	24
INSTALLATION REQUIREMENTS . . . . .	25

<b>CONTENTS:</b>	<b>PAGE</b>
INCLINATION . . . . .	25
FUEL PIPES . . . . .	25
COOLING WATER INTAKES . . . . .	25
EXPANSION TANK . . . . .	26
POWER TAKE OFF ON ENGINE SHAFT IN FRONT (PTO) . . . . .	27
FAULT FINDING SCHEME . . . . .	28
ORDERING SPARE PARTS . . . . .	29

GENERAL PRECAUTIONS

- Ensure that the engine is securely mounted.
- Ensure that the ventilation and combustion air ducts are not obstructed.
- Keep the engine and surrounding areas clean.
- Never allow any part of the body to come into contact with high pressure fuel oil when testing injection equipment.
- Avoid contact with exhaust pipe when the engine is, or has recently been running. These parts can be very hot and can cause severe burns.
- Rectify all fuel, water and oil leaks as soon as possible.
- Isolate the battery when working on the engine.
- All drive belts must receive regular attention.
- Keep electrical contacts free from corrosion etc by smearing them with petroleum jelly.
- Batteries under charge release explosive gases, therefore the battery compartment must be well ventilated at all times. Never allow any smoking, sparks or flames near the batteries.
- Wear protective goggles when handling liquids which are harmful to the eyes, for ex. battery acid. If any of these substances are splashed in the eyes, wash out thoroughly with clean water.
- Many liquids used in engines are harmful if taken internally.  
In the event of accidentally swallowing oil, fuel, anti-freeze or battery acid obtain medical assistance immediately.

## INTRODUCTION

The SABB IVECO-AIFO DIESEL, types 8041 M08 LB and 8061 M12 LB are adapted for life boat propulsion conforming to the latest requirements incl. SOLAS 1974, 1983 AMENDMENTS.

It is essential that the operators read carefully the main points in this manual before the engine is put into service. Reference is made to:

**"CHECKS BEFORE STARTING", "STARTING", "OPERATION" and "STOP".**

The engine must be able to start and operate under the most severe conditions. Therefore the engine must be carefully maintained in accordance with this manual. The engine should be started and tested at regular intervals according to the rules for lifeboat engines.

The information, specifications, illustrations, instructions and statements contained within this publication are given with our best intentions and are believed to be correct at the time going to press. Our policy is one of continued development and we reserve the right to amend any technical information with or without prior notice.

Whilst every effort is made to ensure the accuracy of the particulars contained within this publication neither the Manufacturer, Distributor or Dealer shall in any circumstances be held liable for any inaccuracy or the consequences thereof.

Users of this book are advised that the specification details apply to a range of engines and not to any one particular engine. In cases of difficulty consult SABB MOTOR A.S, BERGEN, NORWAY or a local SABB MOTOR Distributor for further advice and technical assistance.

The informations given is subject to the Company's current Conditions of Tender and Sale, and is for the assistance of users and is based upon results obtained from tests carried out at the place of manufacture. This company does not guarantee that the same results will be obtained elsewhere under different conditions.

Parts that have not been supplied by the SABB MOTOR A.S organisation cannot be relied upon for correct material, dimensions or finish.

This Company cannot therefore be responsible for any damage arising from the use of such parts and the guarantee will be invalidated.

Bergen, Jan.1996

Sabb Motor A/S

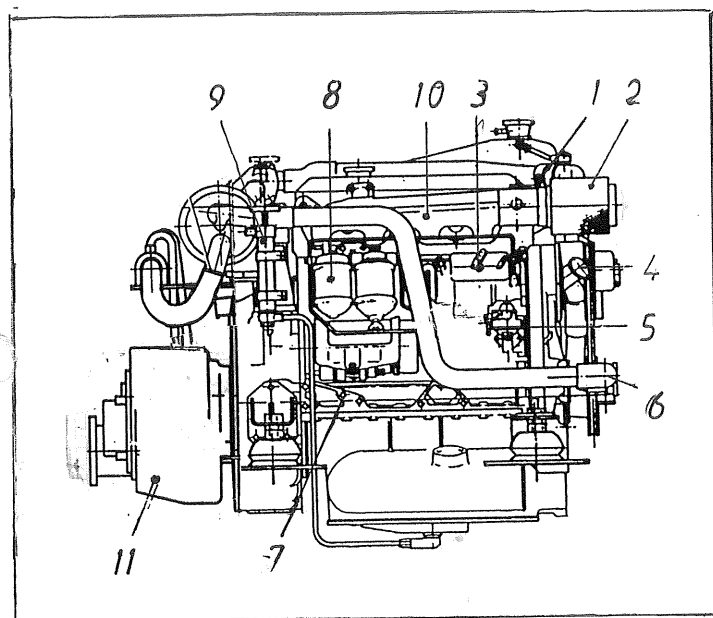
STARBOARD/PORTSIDE VIEWS. TYPE 8041 MOB-LB

Fig. 1

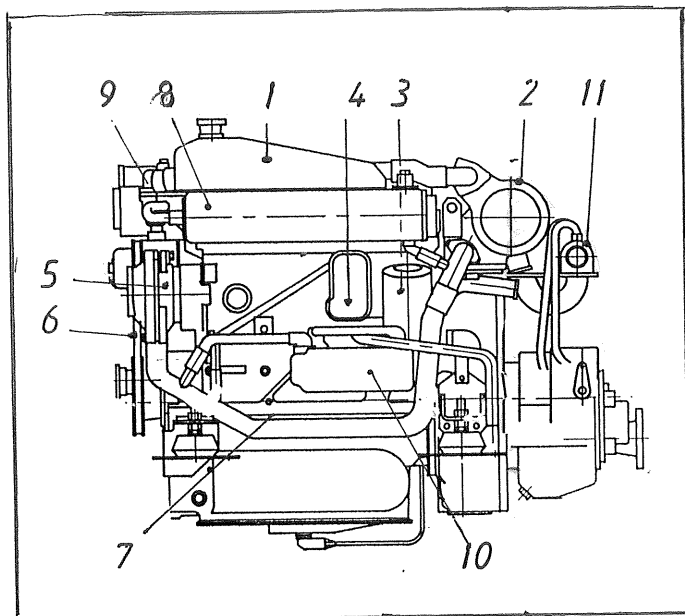


Fig. 2

STARBOARD SIDE VIEW

1. Air cleaner restriction indicator, if fitted
2. Air cleaner
3. Injection pump
4. Oil filler cap
5. Fuel lift pump
6. Sea water pump \*
7. Starter motor
8. Fuel filter
9. Oil extraction pump
10. Intake manifold
11. Gearbox PRM-160

PORTSIDE VIEW

1. Compensating tank
2. Heat exchanger \*
3. Lube oil filter
4. Engine breather
5. Alternator
6. Alternator belt
7. Oil dipstick
8. Exhaust manifold
9. Thermostat socket
10. Engine oil cooler
11. Gearbox oil cooler

Items marked thus \*, are not fitted in keel cooling version.

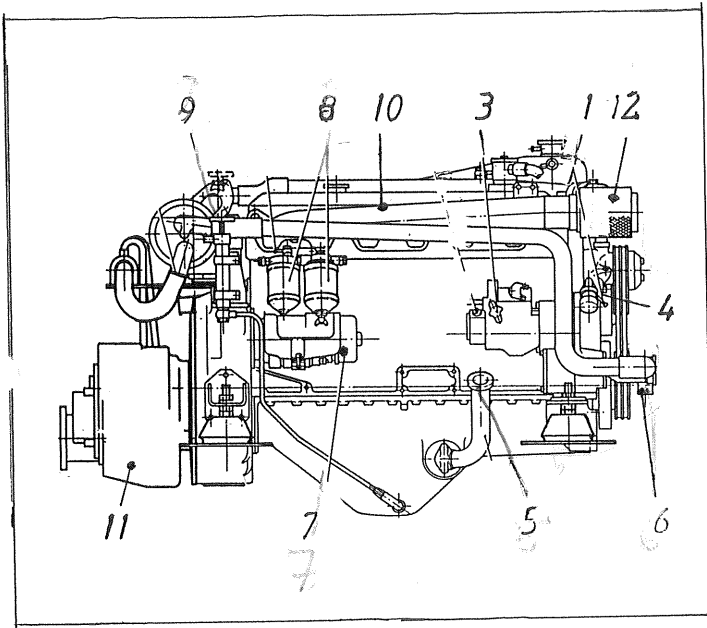
STARBOARD/PORTSIDE VIEWS. TYPE 8061 M12-LB

Fig. 3

STARBOARD SIDE VIEW

1. Air cleaner restriction indicator, if fitted
2. Air cleaner
3. Injection pump
4. Fuel lift pump
5. Oil filler cap /Dipstick
6. Sea water pump \*
7. Starter motor
8. Fuel filter
9. Oil extraction pump
10. Intake manifold
11. Gearbox PRM-302

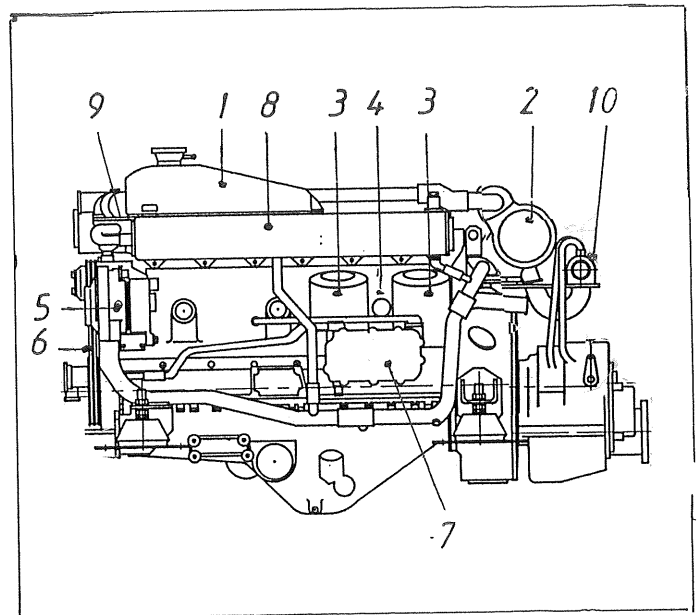


Fig. 4

PORTSIDE VIEW

1. Compensating tank
2. Heat exchanger \*
3. Lube oil filter
4. Engine breather
5. Alternator
6. Alternator belt
7. Engine oil cooler
8. Exhaust manifold
9. Thermostat socket
10. Gearbox oil cooler

Items marked thus \*, are not fitted in keel cooling version.



**ENGINE SPECIFICATION 8041 M08 - LB**

Engine type.....8041 M08  
 4-stroke diesel with direct injection.  
 Cylinders, number and arrangement.....4 in line  
 Bore x stroke.....104 x 115 mm  
 Displacement.....3,9 litres  
 Compression ratio.....17 : 1  
 Net power at flywheel, according to ISO 3046-1  
 - Light duty commercial.....59kW/80 hp  
   at.....2500 rpm.  
 - Continuous duty.....56kW/76 hp  
   at.....2500 o/m  
 Max. speed unloaded.....2750 rpm.  
 Idling speed, min.....600-650 rpm.  
 Fuel consumption at full power.....169 g/hp.hour  
 Rotation, seen from front.....CW  
 Dry weight incl. gearbox PRM-160.....485 kg  
 Intake air consumption.....290 m3/hour  
 Air flow for ventilation.....780 "  
 Max permitted exhaust back pressure.....0,15 kp/cm2  
 Max. exhaust temperature.....560 gr.C  
 Max. engine inclination for normal operation:  
 Longitudinal.....12 gr.  
 Transversal.....30 gr.

**ENGINE SPECIFICATION 8061 M12 - LB**

Engine type.....8041 M12  
 4-stroke diesel with direct injection.  
 Cylinders, number and arrangement.....6 in line  
 Bore x stroke.....104 x 115 mm  
 Displacement.....5,9 litres  
 Compression ratio.....17 : 1  
 Net power at flywheel, according to ISO 3046-1  
 - Light duty commercial.....88 kW/120 hp  
   at.....2500 rpm.  
 - Continuous duty.....85 kW/115 hp  
   at.....2500 o/m  
 Max. speed unloaded.....2770 rpm.  
 Idling speed, min.....600-650 rpm.  
 Fuel consumption at full power.....169 g/hp.hour  
 Rotation, seen from front.....CW  
 Dry weight incl. gearbox PRM-302.....600 kg  
 Intake air consumption.....410 m3/hour  
 Air flow for ventilation.....1100 "  
 Max permitted exhaust back pressure.....0,15 kp/cm2  
 Max. exhaust temperature.....560 gr.C  
 Max. engine inclination for normal operation:  
 Longitudinal.....12 gr.  
 Transversal.....30 gr.

TIMING

Overhead valves controlled by pushrods and rockers with camshaft in crankcase.

Gear driven camshaft.

Valve timing:

-Intake

Opens: before T.D.C.....3°

Closes: after B.D.C.....23°

-Exhaust

Opens: before B.D.C.....48,5°

Closes: after T.D.C.....6°

Clearance between valves and rockers for timing checks:.....0,45 mm

Operating clearance between valves and rockers, cold engine:

-Intake.....0,25 mm

-Exhaust.....0,35 mm

FUEL SYSTEM

Fuel filtration by replaceable cartridge filter. Prefilter or water separator supplied separately for installation by customer.

Fuel supply by double diaphragm pump.

Injection CAV-DPS with rotating piston distributor, all speed governor and variator advance incorporated.

Externally mounted stop solenoid.

Fixed pump delivery start advance.....0° +/- 1°

Fuel injectors setting.....230 + 8 bar

Firing order 4 cyl.....1-3-4-2

" " 6 ".....1-5-3-6-2-4

Fuel oil type.....Gas Oil

If the engine has to work in areas with extremely low ambient temperatures, use fuel oil with good clog characteristic.

Clog point (CFPP) -25°.

LUBRICATION

Forced-feed lubrication by gear driven by camshaft.

Pressure relief valve inserted in the circuit.

Total and continuous oil filtering by replaceable cartridge filter.

Minimum oil pressure:

-At full speed.....2,5 bar

-When idling.....0,7 "

**COOLING SYSTEM, WITH HEAT EXCHANGER**

Cooling by dual water circuit:

- The fresh water in the (closed) primary circuit, which cools the engine, the exhaust manifold, is cooled by the sea water in the secondary circuit (open) by means of a shell-and-tube water/water heat exchanger.

Water circulation by means of a centrifugal water pump with thermostat control which maintains an engine temperature between 79-94 °.

-The sea water in the secondary circuit cools also the oil in marine gear.

Water circulation is provided by a selfpriming pump with an impeller of a special material which can withstand max. 5 minutes of dry running.

Complete sea water circuit is protected from corrosion by replaceable sacrificial anode, located near the impeller pump, on the pressure side. (See page 26.)

**COOLING SYSTEM WITH KEEL COOLING**

Forced water circulation controlled by centrifugal pump.

The fresh water of the circuit cools the engine, exhaust manifold, the engine oil and the marine gear oil.

Water temperature controlled by thermostat.

**ANTI-FREEZE**

An anti-freeze concentration of 50% should be used as an all year round coolant. This concentration will give low temperature protection down to -25° C.

Additionally, a 50% concentration will protect the cooling system from corrosion.

The anti-freeze should meet international standard SAE J 1034, for example:

FIAT PARAFU 11  
VALVOLINE NAPGEL C2230  
ESSO ANTI-FREEZE.

The anti-freeze should be changed every 2. year.

**WARNING:** Anti-freeze contains Monoethylene Glycol and other constituents which are toxic if taken internally, and can be absorbed in toxic amounts under prolonged skin contact.

If clothing is splashed with anti-freeze, it should be washed before being worn again.

If anti-freeze is swallowed accidentally, medical advice should be sought immediately.

**GEARBOX**

Make.....Newage, England

Engine type 8041 M08-LB.....PRM-160

Engine Type 8061 M12-LB.....PRM-302

Direction of rotation.....Right (RH)

**ELECTRIC SYSTEM**

Voltage.....12V 2-pole insulated return  
(Earth return during  
start operation)

Starter Motor..... 3 kW

Alternator.....12V 75 W, Motorola, radio  
suppressed

Engine Block Heater.....42V, 300 W, (Optional)

Air Pre heater.....12V.

Wiring diagrams, see next page.

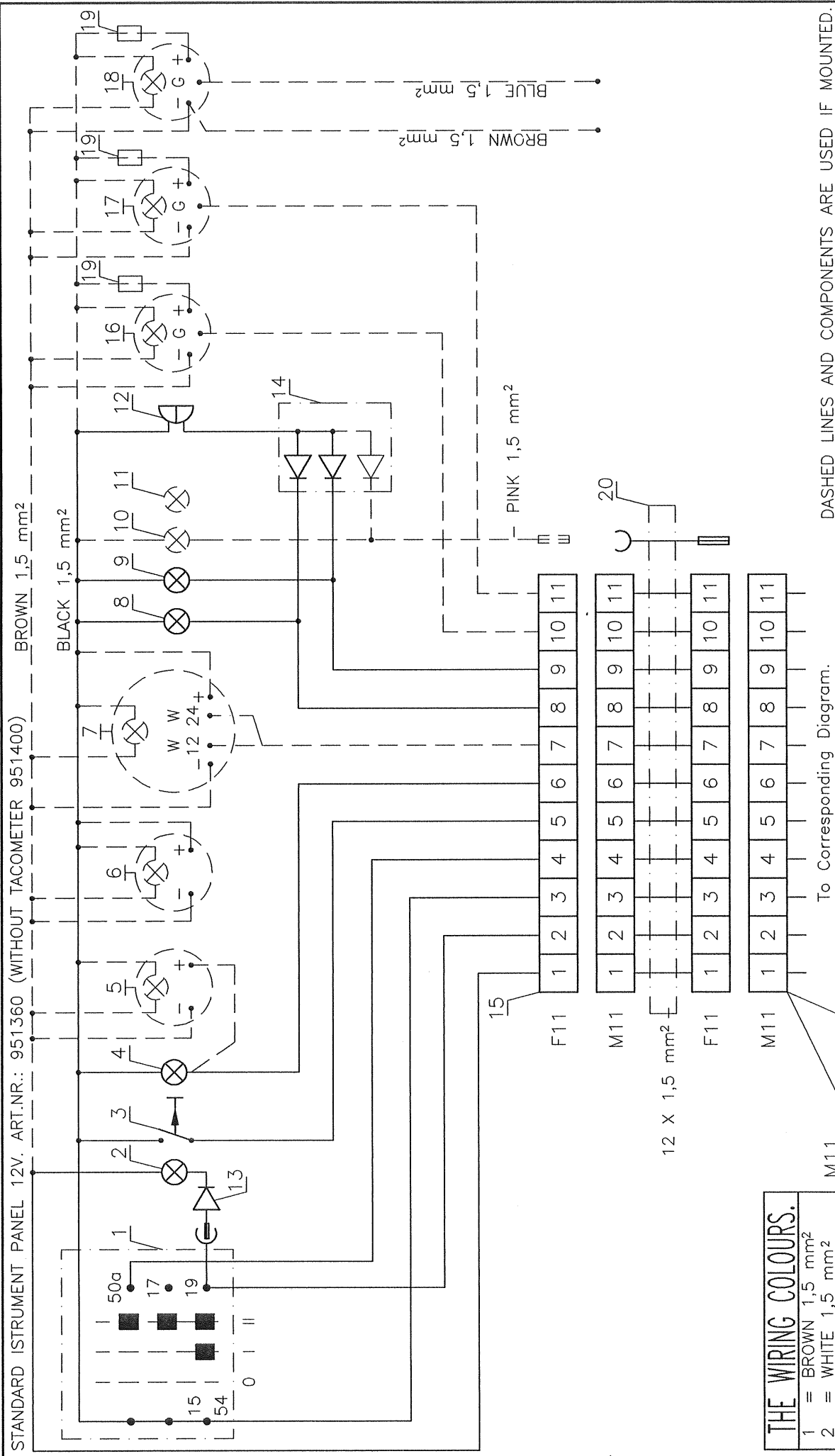
**ENGINE BLOCK HEATER**

The engine is built in compliance with SOLAS 1973/IMO 1983 Regulations, and the minimum cold start requirement is -15° C.

For those engines, engine block heater does not belong to standard equipment, but may be fitted in order to facilitate the starting in cold weather.

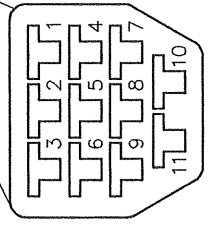
The engine heater is 300 W and the voltage is 42 V.

An externally mounted thermostat controls the heater element and is preset to open the electric circuit below 0° and close above +13°C ambient temperature.



**THE WIRING COLOURS.**

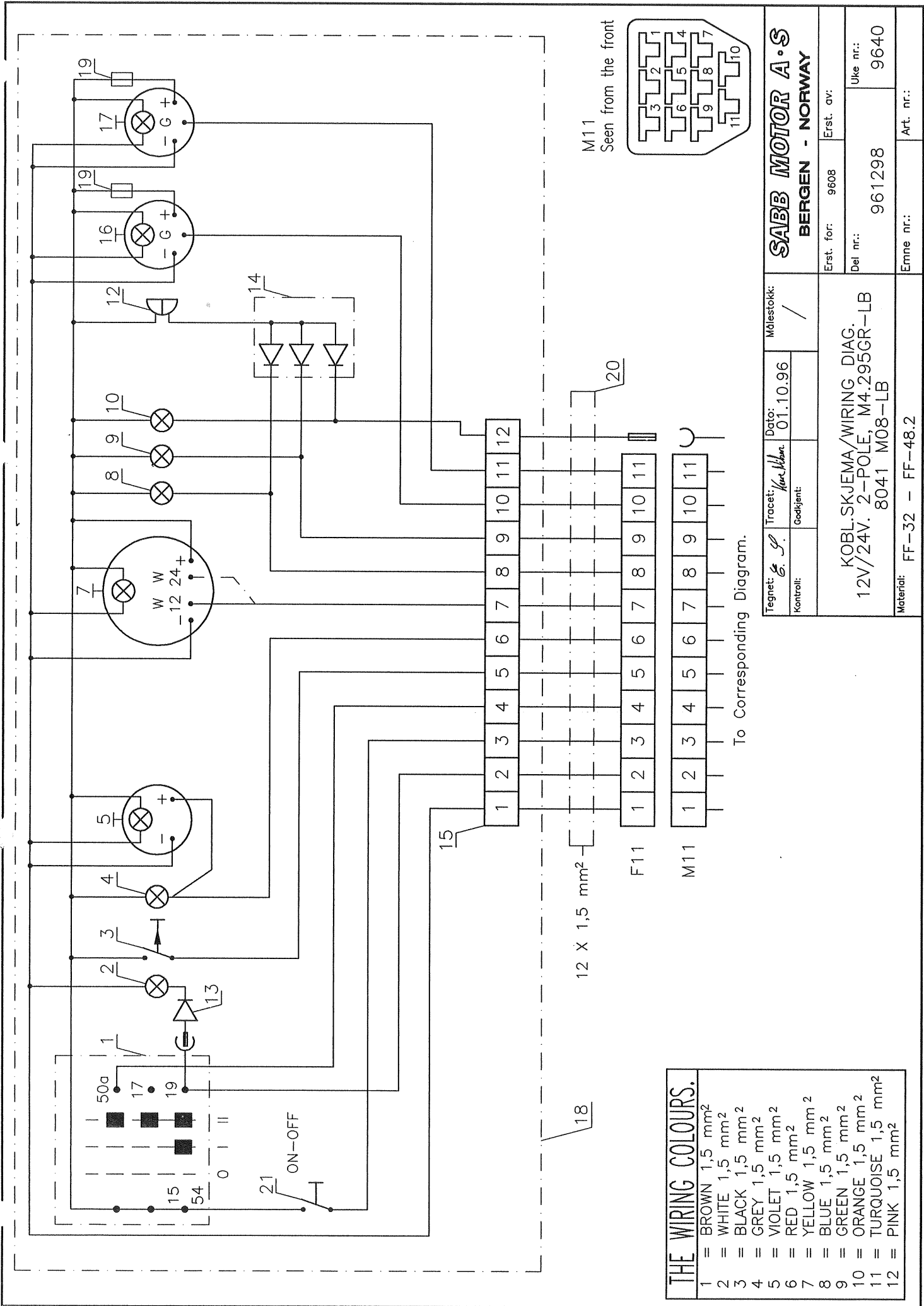
1	=	BROWN 1,5 mm <sup>2</sup>
2	=	WHITE 1,5 mm <sup>2</sup>
3	=	BLACK 1,5 mm <sup>2</sup>
4	=	GREY 1,5 mm <sup>2</sup>
5	=	VIOLET 1,5 mm <sup>2</sup>
6	=	RED 1,5 mm <sup>2</sup>
7	=	YELLOW 1,5 mm <sup>2</sup>
8	=	BLUE 1,5 mm <sup>2</sup>
9	=	GREEN 1,5 mm <sup>2</sup>
10	=	ORANGE 1,5 mm <sup>2</sup>
11	=	TURQUOISE 1,5 mm <sup>2</sup>



Tegnet:	Tracet: <i>Har. Mann.</i>	Dato: 18.09.95	Målestokk: /
Kontroll:	Godkjent:		
KOBLE SKJEMA/WIRING DIAG. 12V/24V. 2-POLE L2, L3, L4, M4, JVECO-LB			
Erst. for: 9411		Erst. av:	
Del nr.: 961190		Uke nr.: 9538	
Emne nr.:		Art. nr.:	

**SABBB MOTOR A·S**  
**BERGEN - NORWAY**

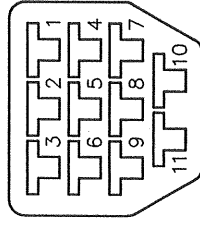
DASHED LINES AND COMPONENTS ARE USED IF MOUNTED.



**THE WIRING COLOURS.**

1	=	BROWN	1,5 mm <sup>2</sup>
2	=	WHITE	1,5 mm <sup>2</sup>
3	=	BLACK	1,5 mm <sup>2</sup>
4	=	GREY	1,5 mm <sup>2</sup>
5	=	VIOLET	1,5 mm <sup>2</sup>
6	=	RED	1,5 mm <sup>2</sup>
7	=	YELLOW	1,5 mm <sup>2</sup>
8	=	BLUE	1,5 mm <sup>2</sup>
9	=	GREEN	1,5 mm <sup>2</sup>
10	=	ORANGE	1,5 mm <sup>2</sup>
11	=	TURQUOISE	1,5 mm <sup>2</sup>
12	=	PINK	1,5 mm <sup>2</sup>

Tegnet: <i>S. J.</i>	Tracet: <i>Kent. Skjema.</i>	Dato: 01.10.96	Målestokk: /
Kontroll:	Godkjent:		
KOBLSKJEMA/WIRING DIAG. 12V/24V. 2-POLE, M4.295GR-LB 8041 M08-LB			
Material: FF-32 - FF-48.2		Erst. for: 9608	Erst. av:
		Del nr.: 961298	Uke nr.: 9640
		Emne nr.:	Art. nr.:



To Corresponding Diagram.

**SABB MOTOR**  
**WIRING DIAGRAM DESCRIPTION FOR LIFEBOAT ENGINE**

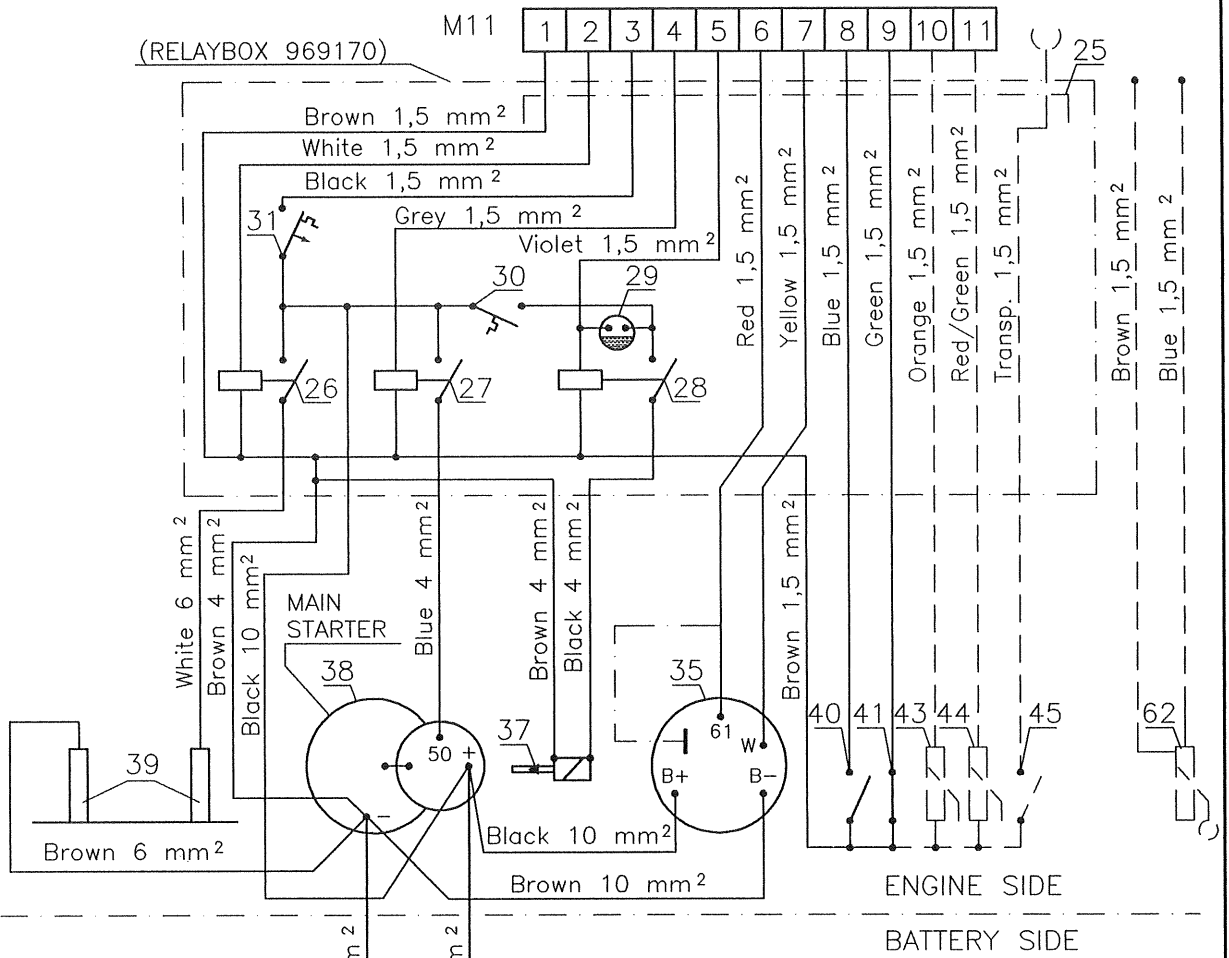
**IVECO 8041 M08-LB / 8061 M12-LB**

WIRING DIAGRAM 12V/24V, 2-POLE NO:961190,961298.  
 CORRESPONDING DIAGRAM NO:961290,961304,961312.

**INSTRUMENT PANEL SIDE:**

PARTS	ART.NR.:
1. Glow Starter Switch / 20A on 50A,100A on 17/19A-----	966016
2. Glow Control Lamp, holder-----	955027
Glow Control Lamp, bulb 12V-2W-----	955028
Glow Control Lamp, bulb 24v-2W-----	955029
- Glow Control Lamp, holder-mounted with the Warning lights	969098
3. Stop button-----	966007
4. Charge control lamp, holder-----	955024
Charge control lamp, bulb 12V-2W-----	955028
Charge control lamp, bulb 24V-2W-----	955029
- Charge control Lamp, holder-mounted w/ the Warning lights	969098
5. Running hour recorder-----	954042
6. Volt meter-12V-----	955005
Volt meter-24V-----	955006
7. Tacometer-----	954043
8. Warning light, cooling water temp.-----	969098
9. Warning light, engine oil pressure-----	969098
10. Warning light, Gear oil pressure-----	969098
11. Warning light, sea water temp.-----	969098
- Warning light/glow/charge control bulb 12V-2W-----	955030
- Warning light/glow/charge control bulb 24V-2W-----	955031
12. Buzzer 12V----- (Black)-----	969024
12. Buzzer 24V----- (Red)-----	969025
13. Diode, compl.-----100V-1A-----	966090
14. Diode, compl., 2-channel-----100V-1A-----	966049
14. Diode, compl., 3-channel-----100V-1A-----	966048
15. Instrument panel harness-----	968370
16. Temperature gauge, fresh water temp.-----	953015
17. Oil pressure gauge 0-5 bar-----	952012
18. Tank gauge----- (Optional)---	952005
19. Resistance (only for 24V)-----	953014
Bulb holder for gauge instrument-----	955055
Gauge instrument bulb 12V-1,2W-----	955053
Gauge instrument bulb 24V-1,2W-----	955054
20. Extencion cabel,-----2000 mm (11-sockets)-	968357
20. Extencion cabel,-----3000 mm (11-sockets)-	968358
20. Extencion cabel,-----4000 mm (11-sockets)-	968359
20. Extencion cabel,-----5000 mm (11-sockets)-	968360
20. Extencion cabel,-----6000 mm (11-sockets)-	968361
20. Extencion cabel,-----7000 mm (11-sockets)-	968362
20. Extencion cabel,-----8000 mm (11-sockets)-	968363
20. Extencion cabel,-----9000 mm (11-sockets)-	968364
20. Extencion cabel,-----10000 mm (11-sockets)-	968365
20. Extencion cabel,-----11000 mm (11-sockets)-	968366
20. Extencion cabel,-----12000 mm (11-sockets)-	968367
20. Extencion cabel,-----13000 mm (11-sockets)-	968413
20. Extencion cabel,-----14000 mm (11-sockets)-	968414
20. Extencion cabel,-----15000 mm (11-sockets)-	968415
20. Extencion cabel,-----16000 mm (11-sockets)-	968416
21. Switch ON/OFF-----	966027

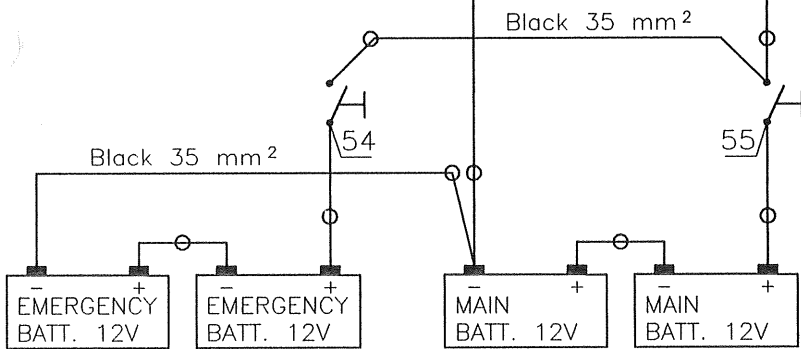
To Corresponding Diagram.



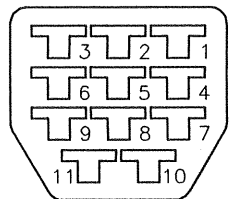
ENGINE SIDE

BATTERY SIDE

DASHED LINES AND COMPONENTS ARE USED IF MOUNTED



M11  
Seen from the front

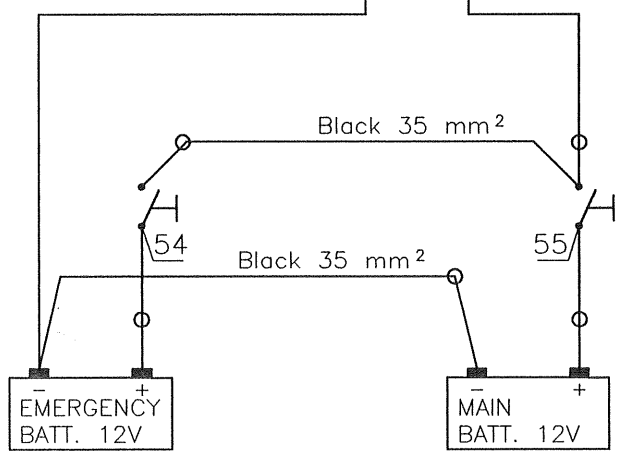
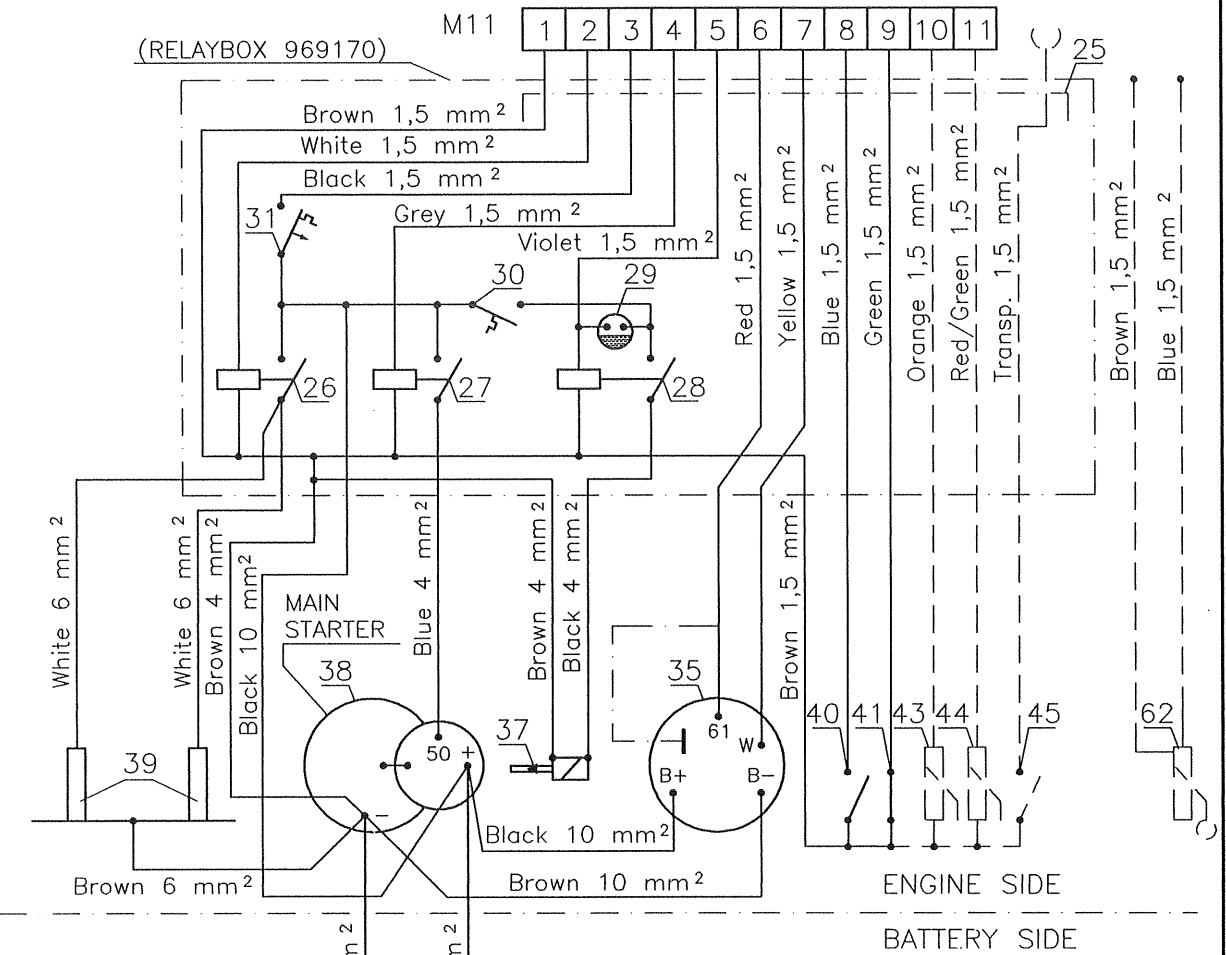


ALL WIRING NOT PROTECTED ELECTRICALLY IS "SHORT CIRCUIT PROOF"

Tegnet: <i>E. S.</i>	Tracet: <i>Knut N. N.</i>	Dato: 05.09.96	Målestokk: /	<b>SABB MOTOR A/S</b>	
Kontroll:	Godkjent:			<b>BERGEN - NORWAY</b>	
KOBLSKJEMA/WIRING DIAG. 24V. 2-POLE, 8041M08-LB				Erst. for: 9538	Erst. av:
				Del nr.: 961290	Uke nr.: 9636
Material:				Emne nr.:	Art. nr.:

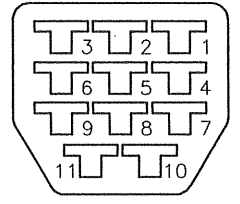


To Corresponding Diagram.



ALL WIRING NOT PROTECTED ELECTRICALLY IS "SHORT CIRCUIT PROOF"

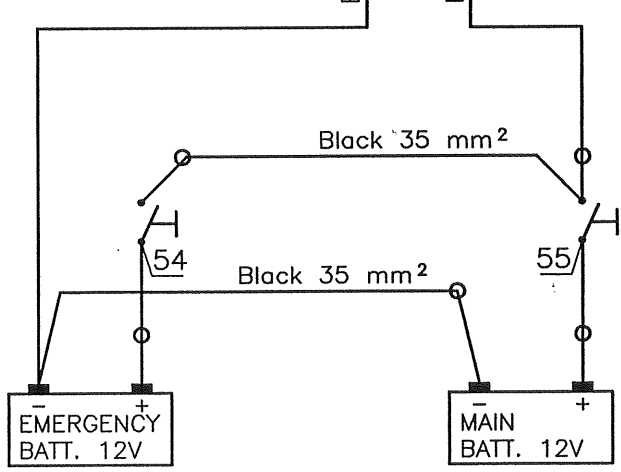
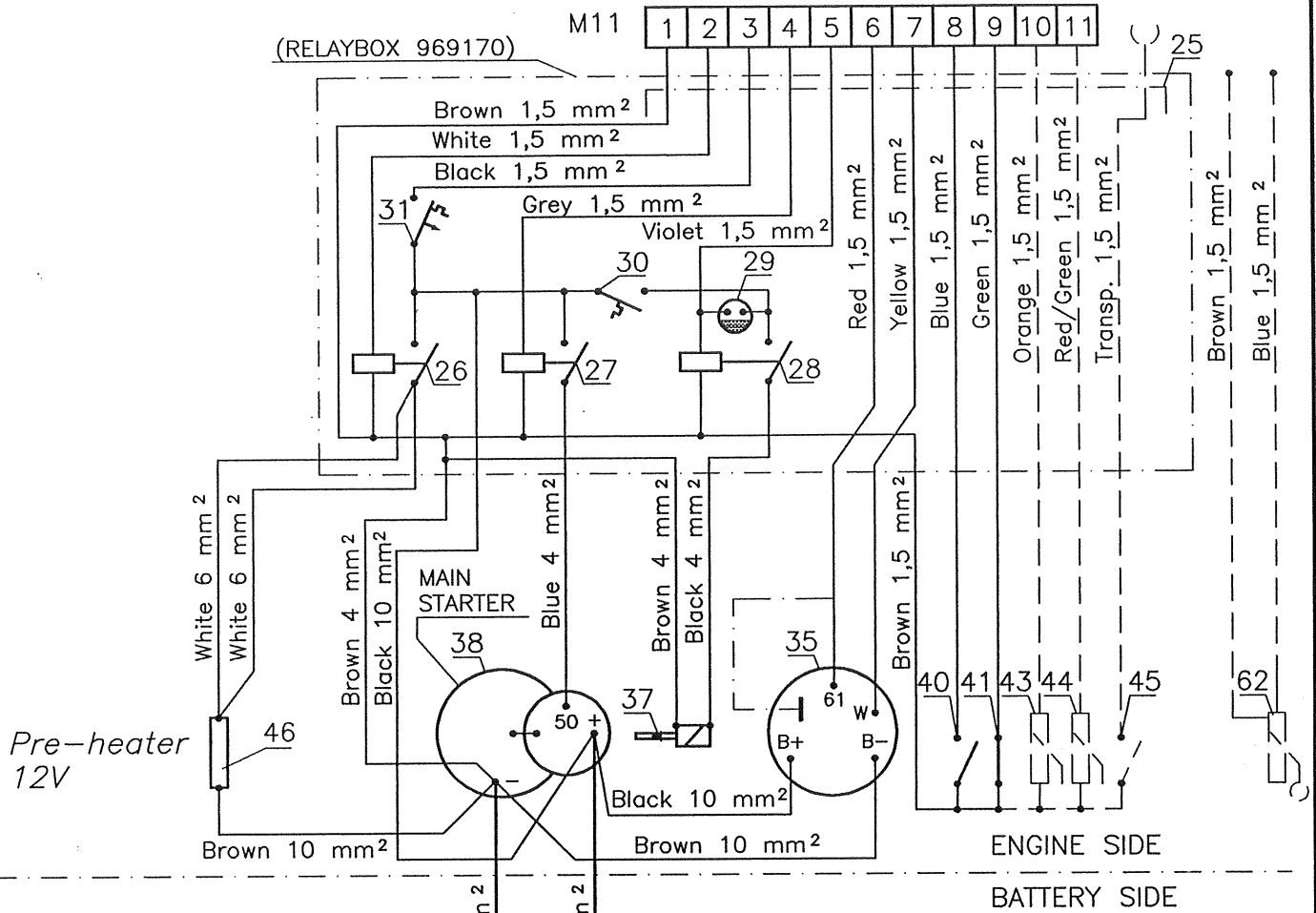
M11  
Seen from the front



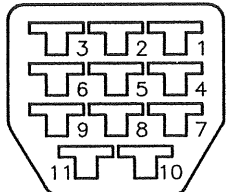
DASHED LINES AND COMPONENTS ARE USED IF MOUNTED

Tegnet: <i>E. S.</i>	Tracet: <i>Kar. N. N.</i>	Dato: 05.09.96	Målestokk: /	<b>SABB MOTOR A · S</b> <b>BERGEN - NORWAY</b>			
Kontroll:	Godkjent:					Erst. for:	Erst. av:
KOBLSKJEMA/WIRING DIAG. 12V. 2-POLE, 8041M08-LB				Del nr.: 961304		Uke nr.: 9636	
				Erst. for:		Erst. av:	
Material:				Emne nr.:		Art. nr.:	

To Corresponding Diagram.



M11  
Seen from the front



ALL WIRING NOT PROTECTED ELECTRICALLY IS "SHORT CIRCUIT PROOF"

DASHED LINES AND COMPONENTS ARE USED IF MOUNTED.

Tegnet: <i>E. S.</i>	Tracet: <i>Knut Nilsen</i>	Dato: 14.04.97	Målestokk: /	<b>SABB MOTOR A·S</b>	
Kontroll:	Godkjent:			<b>BERGEN - NORWAY</b>	
KOBLSKJEMA/WIRING DIAG. 12V. 2-POLE, 8061M12-LB				Erst. for:	Erst. av:
				Del nr.: 961312	Uke nr.: 9716
Material:				Emne nr.:	Art. nr.:

**SABB MOTOR**  
**WIRING DIAGRAM DESCRIPTION FOR LIFEBOAT ENGINE**

---

**IVECO 8041 M08-LB / 8061 M12-LB**

WIRING DIAGRAM 12V/24V, 2-POLE NO:961290,961304,961312.  
 CORRESPONDING DIAGRAM NO:961190,961298.

ENGINE SIDE: \*)POS.29. INVERSION STOP SWITCH: NOT IN USE IF TWIN  
 INSTALLATION

PARTS	ART.NR.:
25. Wiring Loom, Engine side-----	
26. Glow relay / Coil 0.6A 12V switch 60A-----	967044
Glow relay / Coil 0.6A 24V switch 60A-----	967045
27. Start relay / Coil 0.6A 12V switch 60A-----	967044
Start relay / Coil 0.6A 24V switch 60A-----	967045
28. Stop relay / Coil 0.6A 12V switch 60A-----	967044
Stop relay / Coil 0.6A 24V switch 60A-----	967045
*)29. Inversion stop switch 1,6A (+ Clamp 744026)-----	966096
30. Circuit breaker 10A (stop solenoid)-----	966082
31. Circuit breaker 5A (instument panel)-----	966083
35. Alternator, 12V-45A-----	E08108635
Alternator, 12V-70A-----	E08114309
Alternator, 24V-45A-----	E08114310
37. Stop solenoid 12V-----	E08104920
Stop solenoid 24V-----	E08104921
38. Main starter 12V-----	E08104866
Main starter 24V-----	E08104867
39. Pre heater 12V-33A-----	Y327523
40. Alarm switch, fresh water-----	E08114031
41. Alarm switch, oil pressure-0,5/0,8 Bar-----	E08114030
Alarm switch, oil pressure-0,5 Bar-----	E08020872
43. Sender unit, fresh water 0-120 gr.C (optional)-----	953045
44. Sender unit, oil pressure 0-5 bar (optional)-----	952006
45. Alarm switch, sea water 75 gr.C (optional)-----	966025
Alarm switch, gear oil press. 5 Bar (optional)-----	966015
46. Pre heater 12V-56A-----	Y363102
<b>BATTERY SIDE:</b>	
54. Battery Emergency switch,-2-pole (optional)-----	966079
54. Battery Emergency switch,-1-pole-----	966035
55. Battery main switch,-----2-pole (optional)-----	966079
55. Battery main switch,-----1-pole-----	966035
56. Radio battery switch,-----2-pole (optional)-----	966079
56. Radio battery switch,-----1-pole ( " )-----	966035
62. Sender unit, fuel----- ( " )-----	956002

**INSTRUMENT PANEL AND OPERATING CONTROLS**

The engine is normally fitted with following instruments:

1. Tachometer
2. Charge Control Lamp. The light will glow when the battery switch is on, but must go out when the engine has started.
3. Alarms (light and acoustic) warns:
  1. at too high cooling water temperature
  2. at too low oil pressure
4. Oil pressure gauge
5. Water temperature gauge
6. Hour meter
7. Start switch
8. Stop button
9. Voltmeter

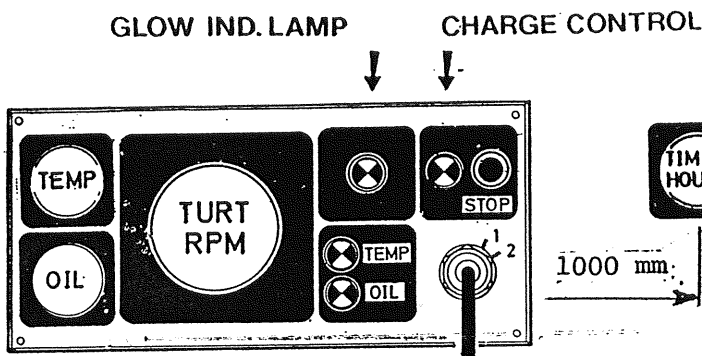


Fig.5 INSTRUMENT PANEL 8041 M08-LB  
8061 M12-LB

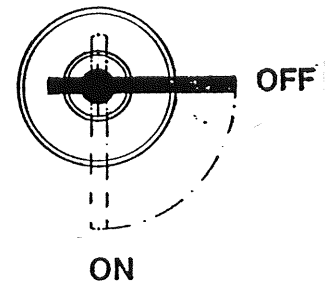


Fig.6

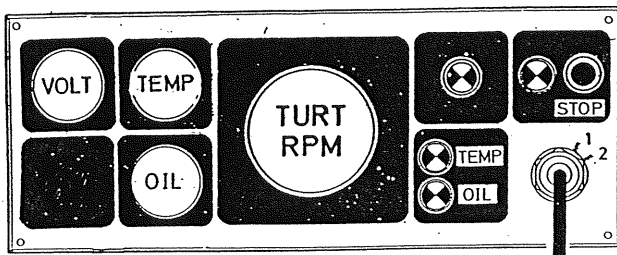


Fig.5a (Alternativ instrument panel)

**BATTERY MAIN SWITCH**

The battery main switch connects the battery to the engine electric system, either of the two batteries may be connected.

A typical switch is illustrated in fig. 6.

**TYPICAL LEVER/LEVERS CONTROL BOX FOR GEARBOX/SPEED CONTROL**

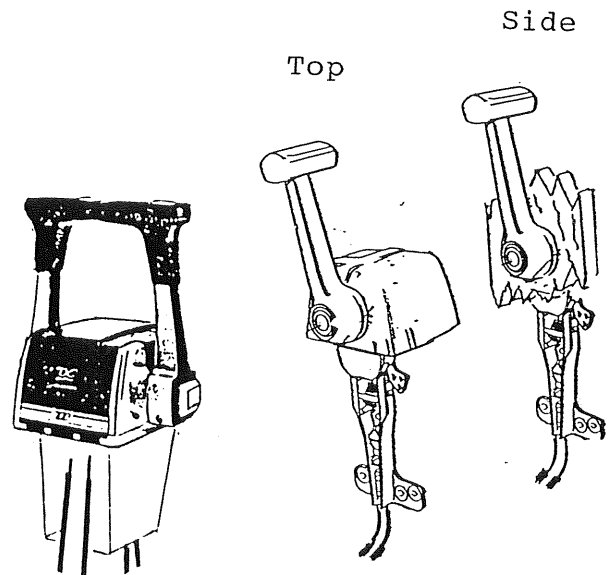


Fig. 7

**STARTING PRECAUTIONS**

Starting any engine can be dangerous in the hands of inexperienced people. Before attempting to start any engine, the operator should be fully conversant with starting procedure and controls.

- Ensure that the batteries are in serviceable condition and correctly connected.
- Check that the oil levels in the engine and the gearbox are correct.
- Check that the fuel tank is full and that the system is primed. - Check that all water drain plugs and cocks are closed. Check that water inlet valves, if fitted, are opened.
- Check that the water level in the expansion tank is filled up with mixture of water/anti-freeze (40%). Under no circumstances must the engine be started without liquid in the cooling system.
- Ensure that the gearbox is in neutral.

**CHECKS BEFORE STARTING**

- Oil level in engine and gearbox.
- Coolant level in header tank.
- Battery main switch is ON. The charge control and oil pressure lights will now be on and the buzzer will sound.

**STARTING**

1. Before attempting to start the engine, the operator should be familiar with the safety precautions as described earlier.
2. Move the speed/gearbox lever into max.speed position by means of the control lever, with gearbox disengaged.
3. Dependent on temperature, turn the starter switch into the preheat position ( position 1) and hold it for 10-20 seconds.  
Then turn the switch further into position 2 to energise the starter.  
Release immediately the engine starts, and it will return to position 0. (Fig.5)  
The alarm light as well as the charging light should now be off. **NOTE!** Type 8061 M12-LB is started by means of start button
- 4, If the engine should fail to start, due to poor battery condition, turn the battery switch to the second start battery and repeat the starting procedure.  
If the engine fails to start within 15 seconds, despite good battery condition, release the switch and investigate the cause (see **FAULT FINDING**). The starter motor should be allowed to cool for at least 15 seconds before attempting to restart.
5. In very cold weather (below appr. - 10°C), it could be necessary to increase the glowing time to appr. 30 seconds and run the starter motor for up to 1 minute.

### STARTING AND RUNNING LIFEBOAT ENGINES WHILE HOOKED IN DAVITS.

For the purpose of function checks the engine should be started and run once a week and after any kind of maintenance work.

As the rubber impeller in the water pump will run dry, the running must be limited to 5 minutes at idle speed.

Special attention should be payed to the water temperature alarm.

### OPERATION

If one or more alarm lamps do not go out, or lights up when the engine runs, the engine should be stopped at once to trace the reason.

When all functions are normal, engage the gearbox by pushing the control lever forward or backward.

Increase the speed gradually if possible, allowing the engine to warm up, before going full speed.

In case of emergency, the lever can be moved into full speed position immediately.

### STOP

Move control lever into neutral position.

Allow the engine to idle for appr. 2 minutes to cool.

Stop the engine by pressing the stop button.

Switch off the battery main switch.

**MAINTENANCE**

The engine has passed the Life Boat Engine Test Programme before delivery. Still however the engine is not completely run in. It is recommended to operate the engine moderately during the first hours after it has been put into service. Full speed only for short periods during the first 15-20 hours.

**INITIAL ATTENTION.**

(AFTER THE FIRST 15 HOURS OF OPERATION)

- Check and tighten all hose clamps and unions, paying particular attention to the fuel system.
- Check and tighten all external nuts and bolts, particularly mounting bolts, shaft coupling bolts and exhaust manifold bolts and nuts.
- Check belt tension, see **ALTERNATOR BELT TENSION.**
- Check lubrication oil and coolant level

**ROUTINE MAINTENANCE PERIODES**

PERIODE	ATTENTION
After the first 15 Hours or after the first 3 Months	See INITIAL ATTENTION
Before Start or Weekly	Check engine oil level. Check coolant level. Check fuel level in tank. Drain water and contaminants from water separator. Grease stern gland.
Every 3 months or 25 hours	Check gearbox oil level. Check battery condition.
Every year or 200 hours	Change engine oil and filter cartridge. Check sacrificial anodes. Grease remote control parts. Change fuel filter cartridge and fuel prefilter. Check drive belt tension. Check electrical connections Check block heater and manifold heater plug.
Every year or 400 hours	Change gearbox oil. Check valve clearance. Check condition of sea water pump impeller. Change sea water filter if mounted.
Every year or 800 hours	Check fuel injectors.  Check engine mountings.

**ENGINE OIL SPECIFICATION**

Atmospheric temperature	Monograde
Below - 15° C	SAE 10 W
Between -15° C and 0° C	SAE 20 W
Between 0° C and + 35° C	SAE 30

Multigrade oil SAE 15W/40 is suitable for all seasons

The oil must meet the requirements of MIL-L-2104 C SERVICE API CD.

Syntetic oil with suitable specification may be used.

The oil level marks on the dipstick are correct only for engines in horizontal position. Check the oil level after installation and readjust the marks if necessary.

**OIL SUMP CAPACITY, INCL. LUBE OIL FILTER AND OIL COOLER:**

B041 M08 LB: 11.5 liter  
B061 M12 LB: 15,0 "

**GEARBOX OIL SPECIFICATION**

Gear, type PRM-160:..... Engine oil SAE15W/40  
" " PRM.302:..... " " "

Gearbox capacity, PRM-160, excl. oil cooler: 1.0 liter.  
" " PRM-302, " " " 2,5 "

**STERN GLAND AND REMOTE CONTROL GREASE**

Following types of uneveral grease may be used:

BP Energrease LS-EP	Fina Marson EPL
Norol Universalfett EP2	Gulfpride SF
Castrol Spheerol AP2	Mobilux 2 eller Mobilplex 2
Chevron Dura-Lith grease no. 2	Shell Alvania Grease EP2
Esso MP grease Beacon EP2	Texaco Multifak EP2



### CHECK OF LUBRICATION OIL LEVEL

The lubrication oil level should always be checked before starting. The level should never be allowed to fall below lower mark. Note that the marks indicate correct level when the engine has appr. horizontal position. The marks should be corrected according to installation angle.

### LUBRICATION OIL CHANGE

The oil change should be done when the engine is warm. Pump up the oil by means of the sump oil drain pump. Fill up new oil according to table through oil filler cap in valve cover. Run the engine after oil and filter change and check for any leaks from oil filter. Stop the engine, allow the oil to settle and top up if necessary.

Oil drain pump

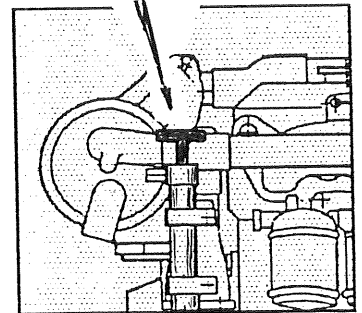


Fig. 8

### CHANGE OF OIL FILTER CARTRIDGE

Use a suitable strap wrench, unscrew and remove the filter cartridge. Thoroughly clean the crankcase oil filter housing face. Apply a thin film of clean oil to the oil filter sealing gasket. Screw on the new oil filter cartridge until the sealing gasket abuts the filter head and tighten a further half turn.

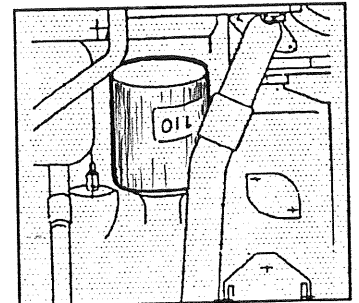


Fig. 9

### GEARBOX OIL CHECK AND CHANGE.

Unscrew the dipstick from the gearbox. Check the oil level by reinserting through hole. Fill up if the oil level is below the mark. Drain the oil through bottom drain plug or through the dipstick hole with a drain pump. Refill new oil according to table to correct level.

### CHANGING FUEL OIL FILTER

If the fuel oil tank is installed at a level above the engine, the cock must be closed before fuel filter change. The filter is shown on Fig.1-3., position 8. Unscrew and discard the filter cartridge and replace it by a new one. Ensure that cartridge is already full of fuel in order to facilitate the bleeding operation. Prime the fuel system after filter change, see following chapter.

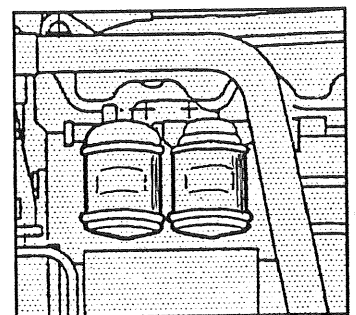


Fig. 10

### WATER SEPARATOR

A water separator/fuel prefilter should always be mounted between the fuel tank and the engine. Drain the separator by loosening the bottom tap. Change the prefilter cartridge. Fit the new one, filled with fuel to facilitate the bleeding.

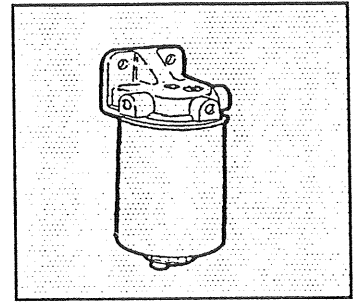


Fig. 11

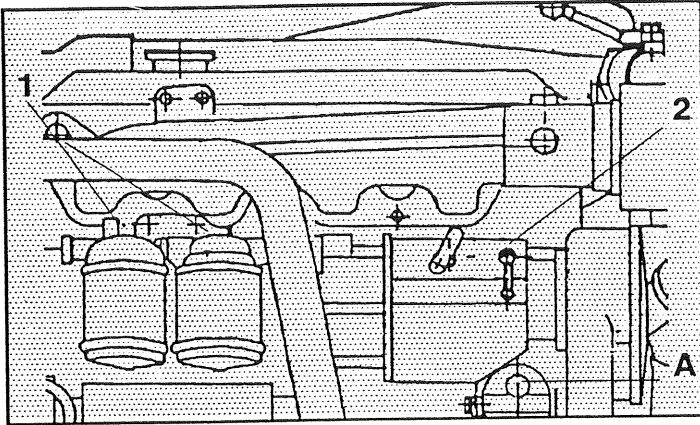


Fig. 12

### PRIMING THE FUEL SYSTEM

The fuel system has to be primed before initial starting, after fuel filter change, if the fuel system has been disconnected, or if the engine has run out of fuel and stops.

Start the priming at the water separator.

1. Loosen the vent plug on top of the separator and let the fuel flow until no air is left. Retighten the vent plug.
2. Loosen the bleed plugs 1 at the fuel oil filter, then operate repeatedly the lever A on the fuel pump. Pump with the fuel lift pump lever until no further air bubbles are left in the fuel oil. Tighten priming plugs.

Proceed in same way to bleed the injection pump, loosening the connector 2 of the fuel return line to the tank. When the fuel flows without bubbles, tighten the connector.

### CLEANING FUEL PUMP FILTER

Unscrew the cover bolt (indicated by the arrow), remove filter element and clean it carefully in diesel oil.

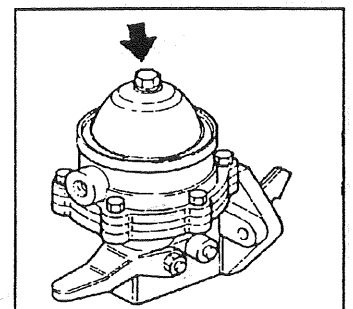


Fig. 13

### REFUELING.

The fuel to be used is: GAS OIL.

The fuel injection equipment is made to very accurate limits and therefore even the smallest particle of dirt entering the system will destroy its efficiency by causing scoring or premature wear on the highly finished parts.

Ensure that scrupulous cleanliness is observed when handling the fuel system components and also the fuel.

Take care that water is not allowed to contaminate the fuel oil. Always install a pre-filter (water collector/sedimentor) in the line between the tank and the engine. The pre-filter must be easily accessible for inspection and draining.

When refueling always apply a fine gauze filter and a clean, dry funnel in the tank filler neck. Before moving the fuel filler cap, clean well near it, and replace the cap after the refueling.

### CHECKING FRESH WATER LEVEL

The water level should be checked with cold engine.

The water level should never be allowed to fall beneath the "MIN" mark.

Fill up with water/anti freeze mixture if necessary.

The level must not exceed the mark "MAX".

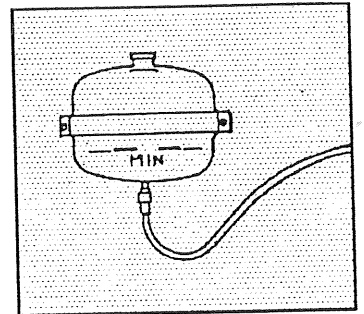


Fig. 14

### BLEEDING THE AIR FROM THE COOLING WATER CIRCUIT. (AT EACH REFILLING)

1. Automatic on the tank-engine connection.
2. Manually performed on the exhaust manifold and on the heat exchanger.

**IMPORTANT:** Fill the circuit gradually in order to allow the automatic bleeding system to operate correctly.

**WARNING:** Be carefull when removing plugs or filler cap when the engine is warm. Use a rag to protect against scalding.

### CHECKING DRIVE BELT TENSION AND CONDITIONS

It is important that the belt tension is checked after an overhaul or when new belt is fitted.

New belt tension:

A force of 7 kg to deflect belt 1-1,5 cm.

To increase the tension:

- Unloose alternator check nuts.
- Move alternator outward and retighten nuts.

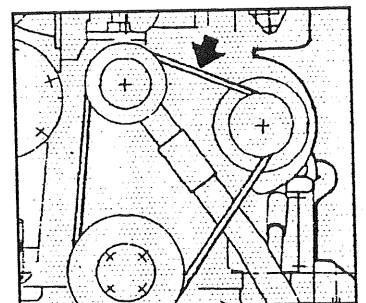


Fig. 15

**CHECK AND CHANGE OF ENGINE HEATER**  
**(IF MOUNTED)**

The block heater belongs to the engine optionals, and is located in the cylinder block just behind the starter motor.

If the heater is being continuously used, the heater element is subject to burning and should be checked yearly or if the heating does not work.

- Drain the coolant through the drain plug.
- Disconnect the leads and unscrew the heater.
- If the inner reducer should loosen, reglue with epoxy glue or Loctite.
- If the element is badly burnt or corroded, replace it by a new one.
- If the the new heater element does not work, check the thermostat and replace if defective. See wiring diagram inside the thermostat box, Fig. 16.

**Note: The engine heater should not be tested in open air as it will be overheated and damaged.**

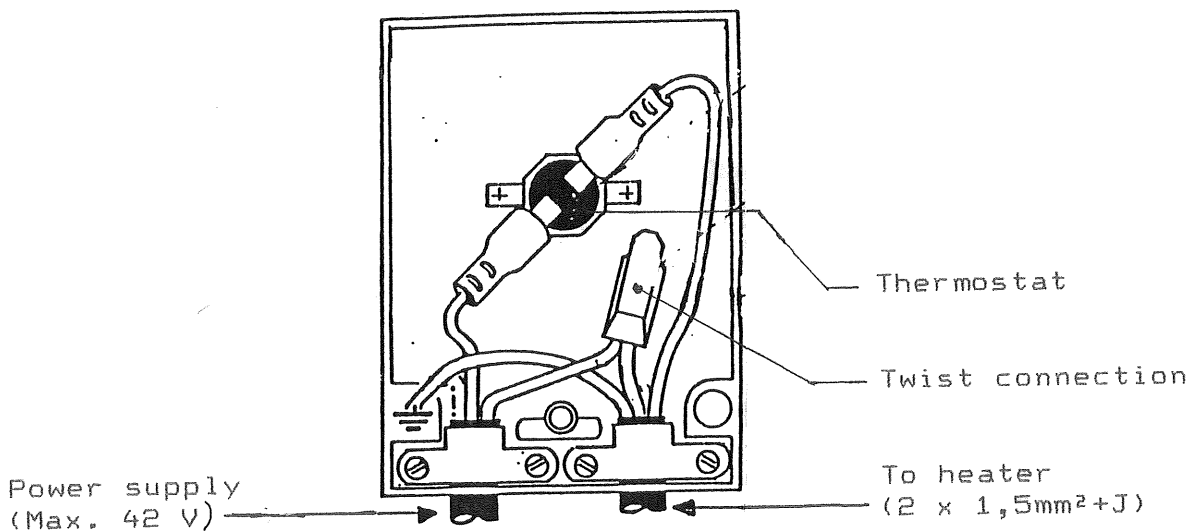


Fig. 16

CHECK OF BATTERY

The condition of the battery should be checked every third month. The specific gravity of a fully charged battery depends on the ambient temperature.

The table below indicates the relationship between the specific gravity and the temperature.

Temperature	Spec. Gravity.	Temperature	Spec. Gravity
0° C	1,287	-10° C	1,259
10° "	1,280	-20° "	1,248
20° "	1,273	-30° "	1,241
25° "	1,270		
30° "	1,267		
35° "	1,263		

The electrolyte level should be 6-9 mm above the separators. Top up with distilled water if necessary.

Keep the battery terminals clean and coat with petroleum jelly.

If the battery is of the maintenance free type without filler plugs, the condition may be checked by means of an accurate digital voltmeter.

The average specific gravity can be calculated according to following formula:

$$\text{SPECIFIC GRAVITY} = \frac{\text{MEASURED VOLTAGE}}{\text{NUMBER OF CELLS}} - 0,84$$

CAUTION

The electrolyte is sulphuric acid and should be handled with great care. Always wear goggles when servicing the battery. If battery acid accidentally is splashed in the eyes, wash with clean water and obtain qualified medical assistance immediately.

GENERAL PRECAUTIONS REGARDING ELECTRIC SYSTEM

The following points must be strictly observed when working on the electric system, otherwise serious damage can occur.

- Never remove any electrical cable without first disconnecting the batteries.
- Never disconnect the alternator cables while the engine is running.
- Only disconnect the batteries with engine stopped and all switches in the OFF position.
- Always check that cables are connected to their correct terminals before reconnecting the batteries. A reversal of polarity or short circuit will destroy diodes and transistors in the alternator and regulator.
- Never flash any connections to check the current flow.
- Always keep the electrical connections properly tightened.

### CHECKING THE CONDITION OF THE SEA WATER PUMP

Close the sea cock.

Remove cover from pump, extract the impeller and make sure that it is neither cracked, chipped nor showing signs of excessive wear, otherwise it must be replaced.

When mounting the impeller, grease it with vaseline to prevent it breaking when the engine is first starting up. Replace the cover gasket and mount the cover. Open the sea cock and check for leakage.

A spare impeller (mark BARCO) should always be kept onboard.

Impeller part no., type 8041 M08-LB: 947029  
 " " " " 8061 M12-LB: 947028

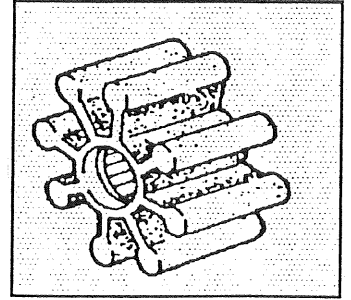


Fig. 17

### CHECKING VALVE CLEARANCE.

The operating clearance between valves and rockers should be 0,25 mm for the inlet and 0,35 mm for the exhaust valve. Adjust the clearance when the engine is cold by means of the screw with stop nut on the head of each rocker.

New engines should be checked after the first 200 hours of operation.

Apart from the prescribed periods, the clearance only requires checking if the rocker cover is unusually noisy.

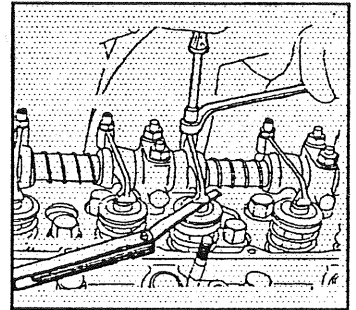


Fig. 18

### CHECKING THE CONDITION OF THE FUEL INJECTORS.

This job must be carried out only by a trained mechanic, using special tools.

Remove fuel injectors from the cylinder heads and have them cleaned.

A proper fuel injector must have the following requirements:

- Each nozzle hole must produce a jet.
- Each jet must be regular and efficient.
- Each nozzle hole must produce the specified spray pattern.
- The injector must neither leak or dribble.
- The injector needle must lift only at setting pressure.

When reassembling fuel injectors torque the nuts of the fixing brackets with a torque wrench to 2,3 kgm.

### VALVE REGRINDING AND CYLINDER HEAD BOLT TORQUE REQUIREMENTS

Should the compression of a cylinder be lacking disassemble cylinder head from the cylinder block and dress the valve seats and valves.

When bolting the cylinder head, clean thoroughly the contact faces and fit the head gasket as described:

- position the gasket to the block and make sure that the ALTO (high) writing on it is brought to contact the cylinder head.

Note: Torquing down of the cylinder head bolts should be performed in four steps (a 15 sec. step-to-step interval is needed). Strictly comply with the operation sequence indicated in the figures and on table here below.

Step 1.		60 Nm	
" 2.	" "	(control)	
" 3.	" "	+ 90°	
" 4.	" "	(control)	

Fig. 19

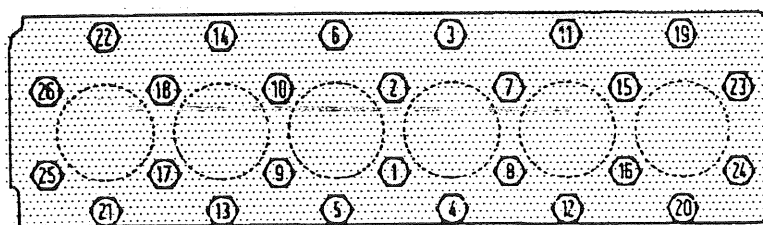
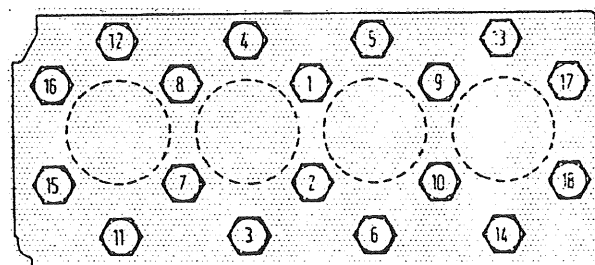


Fig. 20



### TORQUE REQUIREMENTS FOR MAIN ENGINE COMPONENTS

Big end cap .....	4,1 Kgm + 60°
Journal cap .....	8,2 Kgm + 90°
Nut securing pulley hub/vibration damper .....	30 Kgm
Bolt securing flywheel (*) .....	4,1 Kgm + 60°

(\*) Use Loctite type 576 HVX, or similar anaerobic locking liquid.

## INSTALLATION REQUIREMENTS

### INCLINATION.

The engine should be installed as horizontally as possible. The maximum slant admitted for normal operation of the engine is: 12° longitudinal. 30° transversal. Should the figures exceed this values, please ask SABB MOTOR for advice.

### FUEL PIPES

The fuel supply and fuel return pipes must have an internal dia. of at least 8 mm.

A flexible tube of steel armed oil resistant rubber must be inserted between the fuel oil filter and the copper pipe.

A water separator/strainer must be installed as near the tank as possible.

The fuel return pipe must terminate in the proximity of the tank's bottom, so as to avoid defusing the circuit when the engine is shut down.

The fuel tank should be positioned at a lesser height than that of the injector drainage (should this not be possible, a maximum height of 1,5 m is permissible), and as near as possible to the height of the injection pump, bearing in mind that the maximum intake height of the fuel pump, which is incorporated in the latter, is 800 mm.

### COOLING WATER INTAKES

#### Engines with heat exchanger and impeller water pump:

Hose or pipes with minimum 32 mm internal dia. should be used. (This may vary according to the distance between the engine and the sea water intake).

The hose must be sufficiently rigid so as not to restrict the flow by collapsing.

Max.loss of pressure on intake should be kept under 0,5 m w.c. Sea cocks and strainer must be installed between the intake and the engine.

#### Engines with keel cooling:

Hose or pipes with minimum 45 mm internal dia. should be used between the keel cooler and the engine.



## EXPANSION TANK

See drawing below.

With the engine is supplied an expansion tank (loose) made of transparent plastic, having the function to always keep the coolant level above the heat exchanger.

It is compulsory to fit this tank to assure a good engine running.

The installation positions recommended are the no. 1 and 2. The no. 3 position is admitted as an exception on condition that the "max 150 mm" is respected.

A plastic tube of dimension  $\varnothing 7 \times \varnothing 12$  should be used for the connection tank-heat exchanger.

We underline that the coolant level in tank has not to exceed the "MIN", to allow the water expansion when the engine is warm. Control periodically the seals between the heat exchanger and the expansion tank.

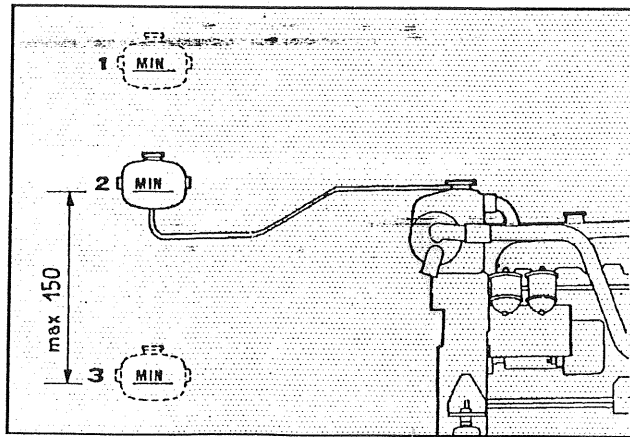


Fig. 21

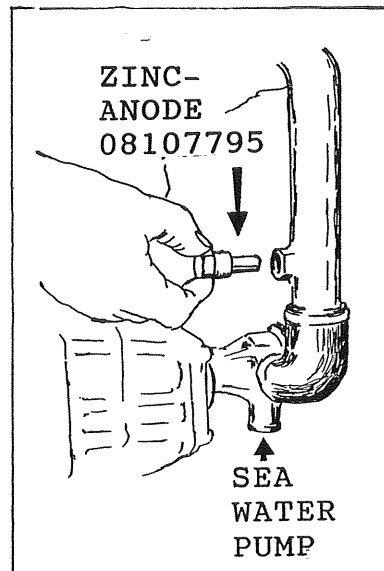


Fig. 22

See  
Page 7

**POWER TAKE OFF (PTO) ON ENGINE SHAFT IN FRONT****PTO limits in line:**

8041 M08 LB : 150 Nm or 40 kW.  
 8061 M12 LB : 200 " " 50 "

**PTO from cam gear train:**

8061 M12 LB : 54 Nm or 13 kW.

**PTO with belt transmission:**

Maximum limits for bending moments due to lateral load, and relative lever arms.

The lever arm "b" is the distance between the line of action of the resulting force due to tension on the belts and the front edge of the oil pan.

The bending moment (Mf) is obtained by multiplying the tension force by the arm "b". The "Mf" and "b" values must be less than the limits reported below:

"Mf" maximum = 75 Nm.  
 "b" " = 190 mm.

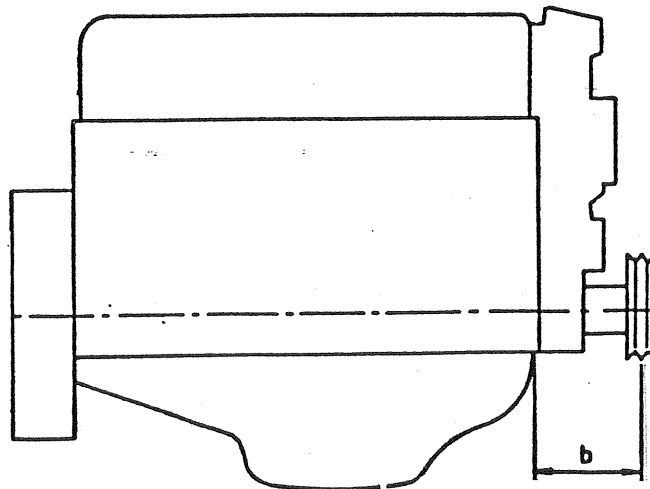


Fig. 23

**FAULT FINDING SCHEME**

This section is intended as a guide only. If in difficulty consult SABB MOTOR A.S.

**DIFFICULT STARTING**

- A. Defect heater plug or engine heater (In cold weather)
- B. Unsuitable lubrication oil
- C. Incorrect fuel
- D. No fuel in tank
- E. Choked fuel filter
- F. Air lock in fuel system
- G. Discharged battery
- H. Poor battery connections

**EXCESSIVE CARBON DEPOSITS**

- A. Choked exhaust system
- B. Unsuitable fuel oil
- C. Unsuitable lubricating oil
- D. Continuous idling

**ENGINE STOPS**

- A. Lack of fuel
- B. Air or water in fuel system
- C. Choked fuel filter
- D. Overload
- E. Overheating, piston seizure
- F. Loss of compression
- G. Lack of lubricating oil

**LOSS OF POWER**

- A. Loss of compression
- B. Choked exhaust system
- C. Fuel injector dirty
- D. Choked fuel filter
- E. Worn engine

**OVERHEATING**

- A. Thermostat faulty
- B. Low coolant level
- C. Water pump belt too slack
- D. Overload
- E. Lubricating oil level too low
- F. Obstructed cooling water system

**ENGINE FAILS TO BE STOPPED**

- A. Stop solenoid linkage is loose.
- B. Defect stop solenoid.
- C. Cable loose or disconnected.

**ORDERING SPARE PARTS.**

For ordering spare parts please see separate SPARE PARTS CATALOGUE for correct part name and part number.

When ordering always state full details:

1. Engine type and Serial No.  
It is also important to mention the type - serial no.  
(Please see identification plate at the end of the page).
2. Part name and part No.
3. Quantity.
4. Full address, name of ship, port of call, marking and forwarding instructions (air freight, air mail, by ship, by mail).

Most parts are available from stock in Bergen.

<b>SABB MOTOR A.S. BERGEN NORWAY</b>		
TYPE	SERIE NR.	HK/TURT.
8061M12-LB	1 NE	120/2500
TYPE	SERIAL NO	HP/RPM