

DIESEL ENGINE OPERATING MANUAL OPERATING FAULTS (TROUBLE SHOOTING)

4.4 OPERATIVE MANAGEMENT III - OPERATING FAULTS

4.4.1 Fault Finding

4.4.1.1 PRELIMINARY REMARKS

4.4.1.1.1 FAULT-FINDING WITH THE AID OF TABLES 4-24, 4-25 AND 4-26

Tables 4-24, 4-25 and 4-26 contain a selection of possible operating faults and their causes. They are intended to contribute to reliable fault diagnosis and rapid resolution of their cause.

4.4.1.1.2 CLASSIFICATION

The faults are grouped into three categories:

- a. Engine start/Engine running,
- b. Operating data and
- c. Other problems.

Firstly, the possible causes of the faults are not usually limited to a single issue. Quite often several possibilities should be considered. The most likely cause can be determined from the points listed, with consideration of

- a. the appearance characteristics,
- b. the time-related and factual aspects and
- c. the person's own experience.

4.4.1.1.3 "INFO" AND "CODE" COLUMNS

The "Info" column contains references to sections in the manual and Work Cards. The "Code" column allows the technical service to identify the specific error, so the table can be employed for user questions, such as "What happens if...?" .

4.4.1.1.4 EXAMPLE

For example, key number 15 appears in the tables in three places (indicated by ●). This means: If the injection timing is too far in the direction "late", the following consequences are possible:

- a. the engine does not reach its full power/speed,
- b. the exhaust gas temperatures are too high and
- c. the exhaust gas plumes are visible and have a dark colour.

4.4.1.1.5 FAULT FINDING WITH THE TURBOCHARGER

Please note that the instruction manual for the turbocharger has its own fault-finding in the document DOOF466180E.

Sequence of the entries

The sequence of the entries has no bearing on the probability of a certain cause. The sequence is based on:

- a. causes related to operating media and their systems,
- b. engine,
- c. turbocharger and
- d. possibly the ship.

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4.4.1.1.6 FAULT FINDING "ENGINE START /RUNNING ENGINE"

Table 4-24: Fault finding table

Error/System	Causes	INFO (Section/Work Card in DO0F466162E Maintenance Manual)	Code
Crankshaft does not turn when starting. Crankshaft turns too slowly, swings back			
Compressed air system	Pressure in the compressed air tank too low		01
	Main starting valve faulty	162.xx	02
	Starting valve faulty	161.xx	03
	Starting air pilot valve faulty	160.xx	05
Control and monitoring system	Error in pneumatic or electronic control system		63
Turning gear	Switching device not fully disengaged		79
Engine reaches firing speed, firing does not occur			
Fuel	Fuel quality inadequate	4.1	09
Fuel system	Fuel tank empty		06
	Fuel system not bled		07
	Injection pumps fail to pump	3.4, 200.xx	08
	Fuel pressure before injection pump too low, feed pump faulty	3.4, 3.5	12
	Fuel filter blocked		13
Injection pump/injection pump drive	Excessive clearance between injection pump piston and pump cylinder	3.5, 200.xx	16
Speed regulation system	Speed governor/booster faulty/interference/incorrectly adjusted	140.xx	56
	Pick-up faulty (engine 32/40)	140.xx, 400.xx	78
Control and monitoring system	Filling release missing/too low		65
	Error in pneumatic or electronic control system		63
Cylinders firing irregularly			
Fuel	Fuel quality inadequate	4.1	09
	Water in fuel	4.1, 000.05	10
Fuel system	Fuel system not bled		07
	Fuel pressure before injection pump too low, feed pump faulty	3.4, 3.5	12
	Fuel filter blocked		13
Injection valve	Injection valves faulty	221.xx	20

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Error/System	Causes	INFO (Section/Work Card in DO0F466162E Maintenance Manual)	Code
Inlet and exhaust valves	Inlet or exhaust valves are sticking, valve springs broken, valves leaking	113.xx, 114.xx	26
The engine does not reach its full power/speed			
Fuel	Fuel quality inadequate	4.1	09
	Water in fuel	4.1, 000.05	10
	Fuel viscosity insufficient, fuel overheated	4.1	66
Fuel system	Fuel system not bled		07
	Fuel pressure before injection pump too low, feed pump faulty	3.4, 3.5	12
	Fuel filter blocked		13
Fuel injection timer	Injection time too late (only for engines with automatic fuelinjectiontimer)	3.4, 200.xx, 120.xx	15 •
Injection pump/injection drive	Excessiveclearancebetweeninjectionpump piston andpumpcylinder	3.5, 200.xx	16
	Injection pump plunger sticking, spring broken	200.xx	17
	Control rod, regulating sleeve or pump element sticking	200.xx	18
	Leaky pressure valve in the injection pump	200.xx	19
Injection valves	Injection valves faulty	221.xx	20
	Nozzle openings or injection pipes blocked	221.xx	21
Speed governor/ Control linkage	Speed governor/booster faulty/interference/incorrectly adjusted	140.xx	56
	Governor or control linkage misadjusted	3.4, 140.xx	22
	Governor control linkage stiff or jammed	203.xx	23
Inlet and exhaust valves	Inlet or exhaust valves are sticking, valve springs broken, valves leaking	113.xx, 114.xx	26
Control and monitoring system	Filling release missing/too low		65
	Speed release too low		89
Turbocharger	Turbocharger contaminated or faulty	500.xx	49

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Error/System	Causes	INFO (Section/Work Card in DOOF466162E Maintenance Manual)	Code
Ship	formarineengines:Propellerdamagedorfoulingon the ship's hull		45
Engine running unevenly, knocking			
Fuel system	Fuel system not bled		07
	Fuel pressure before injection pump too low, feed pump faulty	3.4, 3.5	12
	Fuel filter blocked		13
Engine	Engine or individual cylinders severely overloaded	3.5, 4.3	25
Fuel injection timer	Injection time too early (only for engines with automatic fuelinjectiontimer)	3.4, 200.xx, 120.xx	14
Injection pump/injection drive pump	Injection pump plunger sticking, spring broken	200.xx	17
Injection valves	Injection valves faulty	221.xx	20
Inlet and exhaust valves	Inlet or exhaust valves are sticking, valve springs broken, valves leaking	113.xx, 114.xx	26
	Excessive valve clearance	111.xx	90
Engine running at fluctuating speeds			
Fuel	Air in fuel		75
Fuel system	Fuel pressure before injection pump too low, feed pump faulty	3.4, 3.5	12
Speed governor/ Control linkage	Governor misadjusted, control linkage overly extended	3.4, 140.xx	22
	Speed governor/booster faulty/interference/incorrectly adjusted	140.xx	56
	Governor control linkage stiff or jammed	203.xx	23
	Pick-up faulty (engine 32/40)	140.xx, 400.xx	78
Injection pump/injection drive pump	Control rod, regulating sleeve or pump element sticking	200.xx	18
Control and monitoring system	Speedreferencevalue unstable(airleakage/electrical signal)		58
Engine speed drops, engine stops			

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Error/System	Causes	INFO (Section/Work Card in DOOF466162E Maintenance Manual)	Code
Fuel	Water in fuel	4.1, 000.05	10
Fuel system	Fuel tank empty		06
	Fuel pressure before injection pump too low, feed pump faulty	3.4, 3.5	12
	Fuel filter blocked		13
Engine	Engine or individual cylinders severely overloaded	3.5, 4.3	25
Speed governor/ Control linkage	Set speed value failed		59
	Governor control linkage stiff or jammed	203.xx	23
Control and monitoring system	Shut-down device triggered	3.4	24
Overspeed protection triggered			
Speed governor/ Control linkage	Speed governor/booster faulty/interference/incorrectly adjusted	140.xx	56
	Speed governor - Setting of the "dynamics"	140.xx	57
	Governor control linkage stiff or jammed	203.xx	23
Control and monitoring system	Overspeed relay faulty		85
Exhaust gas plume sooty, dark			
Fuel	Fuel quality inadequate	4.1	09
Engine	Engine or individual cylinders severely overloaded	3.5, 4.3	25
Charge air system	Charge air too cold	3.5	73
Fuel injection timer	Injection time too late (only for engines with automatic fuelinjectiontimer)	3.4, 200.xx,	15 •
Injection pump/injection pump drive	Fuel injection pump, baffle screws worn	200.xx	69
Injection valves	Injection valves faulty	221.xx	20
Inlet and exhaust valves	Inlet or exhaust valves are sticking, valve springs broken, valves leaking	113.xx, 114.xx	26
Control and monitoring system	Charge limit too high (marine main engines - only in manoeuvring operation)		64
Turbocharger	Turbocharger contaminated or faulty	500.xx	49
	Air intake filter clogged (lack of air)		91
Exhaust gas plume bluish			
Fuel	Water in fuel	4.1, 000.05	10

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Error/System	Causes	INFO (Section/Work Card in DOOF466162E Maintenance Manual)	Code
Lube oil system	Oil level in oil sump too high (wet sump)		34
Piston/Piston rings	Excessive piston ring clearance or gap too big	3.5, 034.xx	28
	Piston rings stuck fast or broken	034.xx	32
Turbocharger	Turbocharger over-lubricated	500.xx	92
Noise from valve or injection pump drive (noise speed-related)			
Injection pump/injection drive	Injection pump plunger sticking, spring broken	200.xx	17
	Drive roller faulty or broken spring	200.xx	46
Inlet and exhaust valves	Inlet or exhaust valves are sticking, valve springs broken, valves leaking	113.xx, 114.xx	26
	Excessive valve clearance	111.xx	90
Fumes from crankcase/crankcase ventilation, muffled noises originating from crankcase			
Lubricating oil	Water content too high	4.1, 000.05	81
Engine	Crankcase ventilation blocked		93
Piston/Piston rings	Excessive piston ring clearance or gap too big	034.xx	32
Running gear/Crankshaft	Piston or bearing running hot or starting to pick up	3.4, 4.3	31
Oil mist detector triggered			
Oil mist detector	Sensitivity incorrectly set		76
	Condensed water in measuring unit (if engine-room fans blow cold air onto detector)		77
Lubricating oil	Lubricating oil - water content too high	4.1, 000.05	81
Piston/Piston rings	Excessive piston ring clearance or gap too big	3.5, 034.xx	28

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Error/System	Causes	INFO (Section/Work Card in DO0F466162E Maintenance Manual)	Code
Running gear/Crankshaft	Piston or bearing running hot or starting to pick up	3.4, 4.3	31
Splash oil monitoring system triggered			
Lubricating oil	Lubricating oil - Temperature too high		104
	Lubricating oil - Temperature deviation from the mean value too great		105
Running gear/Crankshaft	Piston or bearing running hot or starting to pick up	3.4, 4.3	31

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4.4.1.1.7 FAULT FINDING "OPERATING DATA"

Table 4-25: Errors and their causes/fault finding – Part 2 – "Operating Data"

Error/System	Causes	INFO (Section/Work Card in DOOF466162E Maintenance Manual)	Code
Cooling water temperature too high			
Cooling water system (HT system)	Cooling water shortage or air in the cooling watersystem		42
	Cooling water chambers and/or radiator	000.08	43
	Cooling water pump faulty		44
	Temperature control faulty		47
	Preheating device active		87
Engine	Engine or individual cylinders severely	3.5, 4.3	25
Control and monitoring system	Indicating instrument or connection line faulty		39
Cooling water pressure too low			
Cooling water system (HT system)	Cooling water level in the tank too low		70
	Leakage in the system		71
	Lines blocked, components blocked		74
	Cooling water pump faulty		44
	Stand-by pump not started		82
Control and monitoring system	Indicating instrument or connection line faulty		39
	Pressure switch/Measuring transducer faulty		61
Lube oil temperature too high			
Cooling water system (re-cooling system)	Cooling water shortage or air in the cooling watersystem		42
	Cooling water chambers and/or radiator contaminated	000.08	43
	Cooling water pump faulty		44
	Temperature control faulty		47
	Preheating device active		87
Control and monitoring system	Indicating instrument or connection line faulty		39
Lube oil pressure too low			

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Error/System	Causes	INFO (Section/Work Card in DOOF466162E Maintenance Manual)	Code
Lube oil system	Low oil level in the service tank		35
	Pressure relief valve of the lube oil pump, broken spring		36
	Pressure regulating valve faulty		60
	Lube oil pipes leaking		37
	Lube oil lines blocked		80
	Lube oil filter clogged		38
	Lube oil pump faulty		41
	Stand-by pump not started		82
Control and monitoring system	Indicating instrument or connection line faulty		39
Exhaust gas temperature (level control deviation or mean value change)			
Fuel system	Fuel pressure before injection pump too low, feed pump faulty	3.4, 3.5	12
Engine	Engine or individual cylinders severely	3.5, 4.3	25
Charge air system	Charge air temperature too high, charge air pressure toolow	3.5	48
	Error in the bypass system		62
Injection time maladjustment	Injection time too late (only for engines with automatic fuelinjectiontimer)	3.4, 200.xx, 120.xx	15 ●
Injection valves	Injection valves faulty	221.xx	20
Fuel injection pump	Fuel injection pump - incorrect setting	200.xx	67
	Fuel injection pump faulty	200.xx	68
Cylinder head	Cylinder head - Inlet duct contaminated	055.xx	88
Inlet and exhaust valves	Inlet or exhaust valves are sticking, valve springsbroken, valves leaking	113.xx, 114.xx	26
Control and monitoring system	Indicating instrument or connection line faulty		39
	Temperature sensor faulty		84
	Cabling/Connections defective/faulty		86
Turbocharger	Turbocharger contaminated or faulty	500.xx	49
Ship	for marine engines: Propeller damaged or foulingon theship's hull		45
Charge air temperature too high			

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Error/System	Causes	INFO (Section/Work Card in DOOF466162E Maintenance Manual)	Code
Intake air system/ Charge air system	Intake temperature too high	3.5	50
	Charge air cooler contaminated (pressure difference too great)	3.5, 322.xx	53
	Leakage on air and exhaust side		52
Exhaust gas system	Exhaust gas counter pressure too high (exhaust boiler contaminated)	3.5	54
Injection time maladjustment	Injection time too early (only for engines with automatic fuelinjectiontimer)	3.4, 200.xx,	14
Control and monitoring system	Indicating instrument or connection line faulty		39
Turbocharger	Air filter, compressor/turbine side of the turbocharger contaminated /damaged	500.xx	51
Charge air pressure too low			
Intake air system/ Charge air system	Intake temperature too high	3.5	50
	Charge air cooler contaminated (pressure difference too great)	3.5, 322.xx	53
	Leakage on air and exhaust side		52
Exhaust gas system	Exhaust gas counter pressure too high (exhaust boiler contaminated)	3.5	54
Injection time maladjustment	Injection time too early (only for engines with automatic fuelinjectiontimer)	3.4, 200.xx,	14
Control and monitoring system	Indicating instrument or connection line faulty		39
Turbocharger	Air filter, compressor/turbine side of the turbocharger contaminated /damaged	500.xx	51
Crankshaft bearing - temperature too high			
Crankshaft bearing	Bearing damaged, faulty lubrication	021.xx	72
Engine	Alignment/foundation faulty	000.09, 012.xx	95
Control and monitoring system	Temperature sensor faulty		84
	Cabling/Connections defective/faulty		86

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4.4.1.1.8 FAULT FINDING- OTHER PROBLEMS

Table 4-26: Errors and their causes/Fault finding – Part 3 – "Other Problems"

Error/System	Causes	INFO (Section/Work Card in DO0F466162E Maintenance Manual)	Code
Stiff/blocked movement of the governor control linkage of the injection pumps			
Speed governor/ Control linkage	Governor or control linkage misadjusted	3.4, 140.xx	22
	Governor control linkage stiff or jammed	203.xx	23
Control and monitoring system	Shut-down device triggered	3.4	24
Injection pump delivers unevenly			
Fuel	Fuel viscosity insufficient, fuel overheated	4.1	66
Fuel system	Fuel system not bled		07
	Fuel too cold, solidified in the fuel pipes (heavy fuel)	4.1	11
	Fuel pressure before injection pump too low, feed pump faulty	3.4, 3.5	12
	Fuel filter blocked		13
Injection pump/ injection pump drive	Injection pump plunger sticking, spring broken	200.xx	17
	Leaky pressure valve in the injection pump	200.xx	19
	Control rod, regulating sleeve or pump element sticking	200.xx	18
Starting pipe to cylinder head getting hot			
Cylinder head	Starting valve leaky	161.xx	04
Safety valve in the cylinder head blows off			
Engine	Engine or individual cylinders severely	3.5, 4.3	25
Cylinder head	Safety valve, spring broken	057.xx	27
Injection time maladjustment	Injection time too early (only for engines with automatic fuel injection timer)	3.4, 200.xx, 120.xx	14

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