

Reference Example of drafting an instruction manual

This reference complements descriptions related to the requirements of this standard and does not form part of it.

Instruction manual (Operation volume)	
	Chapter
Introduction	1
Engine Outline	2
References for engine adjustments	3
Outline of construction	4
Operating procedures	5
Inspection and maintenance	6
Fuel oil, lubricating oil and cooling water	7
Uses of various tools	8
Causes of abnormalities and failures, and countermeasures	9
○ Please refer to the separate instruction manual (maintenance volume) for disassembly, maintenance, reassembly and parts list, and parts book.	

Introduction	Engine model	I-0
Before operating the engine	DE28	1

1. This instruction manual describes the correct operating method of engine model DE28, routine maintenance and inspection procedures.

To keep the engine in normal conditions and to ensure the design performance, please read this book with care before operating the engine, and master how to handle the engine.

2. Where marked  , important safety requirements are described, and particular caution is required.

3. Depending upon the specifications, the particulars and the construction of an engine can differ from those shown in this manual. In this case, the engine specifications and finished plans submitted separately have priority over this manual.

4. Please refer to the individual instruction manuals for handling the following items of machinery and equipment:

- (1) Turbocharger
- (2) Governor
- (3) Control equipment
- (4) Other attached equipment under special specifications

5. Replacement parts shall be those genuine parts designated by the manufacturer under any circumstances.

Any inquiries for ordering parts or services shall be directed to the sales outlets or the manufacturer's service agents specified at the end of this manual.

When making inquiries, specify engine type and serial number.

6. This instruction manual shall be placed permanently at the prescribed location so that it can be read by those engaged in operation or maintenance of the engine at any time, and duties shall be transferred to relieving personnel without fail.

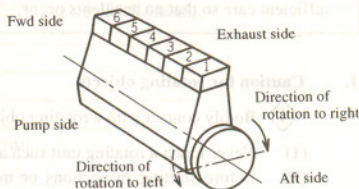
○ The SI unit system is used throughout this manual for numerical data. Those shown in { } are in the conventional unit system shown for reference only.

- Using the engine in a manner differing from its intended use or not in compliance with the handling procedure shown in this manual might cause accidents or failures, and you are requested to strictly refrain from these bad practices.
- This manual is subject to change without notice.

0-1	Introduction	Engine model	I-0
3	Terms and symbol marks	DE28	2

1. For the purposes of this instruction manual, the following definitions apply to major terms used in this manual:

- Aft side of engine Output end (flywheel side)
- Fwd side of engine Counter side of the output end
- Exhaust side Exhaust manifold side (right side viewed from the output side)
- Pump side Fuel injection pump side (left side viewed from the output side)
- Direction of rotation to right Clockwise viewed from output end
- Direction of rotation to left Counter-clockwise viewed from the output end
- Cylinder No. Numbered 1, 2, 3, ... from the output side



2. In this manual and safety alert labels of the engine, the following symbols are used:

(1) Safety sign and signal words



... "Warning" = A danger which may lead to serious injury or death if not avoided.



... "Caution" = A danger which may lead to slight or injury if not avoided.



... "Notice" = Operational caution to avoid damage to the engine.



... "Prohibition"



... "Recommendation/command" = Behavioural recommendation or command related to safety.

(3) Safety signs symbols

(a) Warning signs



... General warnings



... Combustibility → Fire



... Explosiveness → Explosion, bursting



... Toxicity → Poisoning



... Electricity → Electrical shock



... High temperature → Burn



... Rotating/Moving object → Being crushed



... Sharp edge → Incised wound



... High-pressure fluid → Injury



... High elevation → Fall

(b) Prohibitions signs



... Unspecified items banned in general



... No smoking



... Use of naked flame prohibited



... No contact

(c) Obligatory signs



... Wear eye protection → Goggles



... Wear head protection → Helmets



... Wear ear protection → Earplugs



... Wear hand protection → Safety gloves



... Wear foot protection → Safety shoes

(d) Others



... See other pages, other documents

I-0	Introduction	Engine model	I-0
2	Safety Precautions	DE28	3

When operating, a diesel engine rotates at a high speed and there are risks arising from high temperature spots, presence of oils, water and high-pressure air. Therefore, handle the engine with sufficient care so that no accidents occur.

1. Caution for rotating objects



Bodily contact with a rotating object can lead to crushing injuries, therefore, it is very dangerous.

- (1) Never touch a rotating unit such as flywheel and coupling, while the engine is operating.
- (2) Before starting inspections or maintenance work, return the manoeuvring handle to the "Stop" position, securely close valves on the starting air line, and confirm that the engine does not turn.
- (3) After inspections or maintenance work, ensure that the turning gear and the turning bar are in the "Disengaged" condition.
After confirming that no object is in contact with the rotating assemblies of the engine, refix covers to their original condition.
- (4) When starting the engine, confirm the safety of persons and tools in the surrounding area.

2. Caution for temperature



The engine immediately after stopping operation, particularly the areas in the vicinity of the exhaust manifold, turbochargers, indicator valves, and cylinders have high temperatures, involving a risk of sustaining burns.

- (1) Do not touch the engine when it is operating or immediately after stopping with bare hands or skin.
- (2) When taking measurements, while the engine is operating, wear protective items such as gloves without fail.
- (3) Carry out inspections and maintenance work of the engine after it has cooled down sufficiently.

3. Caution for pressures



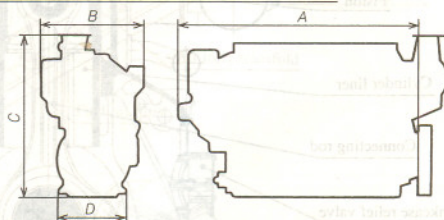
High-temperature oils and water flow through the engine when it is operating. Oil leakages, in particular, can lead to a serious fire.

- (1) When the engine is operating, pay attention to leakages of fluid from the piping, and if any leakage is detected, stop the engine immediately and carry out repairs as appropriate.
- (2) When a piping line is disassembled, carry out priming after reassembly without fail, confirm possible leakages through pipe joints, and then start the engine.

Engine outline	Engine model	I-1
Principal engine particular · Types of auxiliary machinery	DE28	1

Principal engine particulars

Engine model		DE28
Type of engine		Vertical, water-cooled, direct injection, 4-cycle diesel engine
Number of cylinders		6
Cylinder bore	mm	280
Piston stroke	mm	350
Rotating speed	min ⁻¹	720
Shaft output	kW {PS}	1 500 {2 040}
Firing order		1-4-2-6-3-5
Direction of rotation		Clockwise viewed from flywheel side
Supercharging system		Exhaust gas turbocharging with air intercooler
Starting method		Compressed air
Cooling method	Jacket	Fresh water
	Cooler	Sea water or fresh water
Engine size	Length overall (A)	mm 3 400
	Width (B)	mm 1 700
	Height (C)	mm 2 700
	Installed width (D)	mm 1 200
	Engine mass	kg 16 000



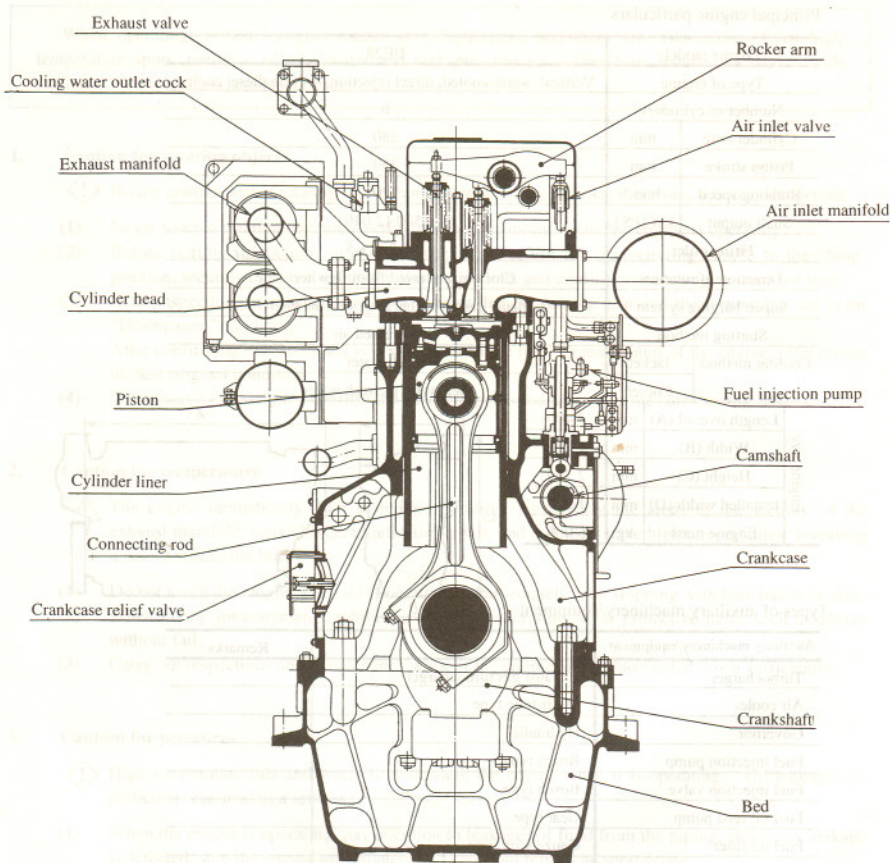
Types of auxiliary machinery/equipment

Auxiliary machinery/equipment	Type	Remarks
Turbocharger	Exhaust gas turbocharger	
Air cooler	Multi-tube type	
Governor	Hydraulic	
Fuel injection pump	Bosch type	
Fuel injection valve	Bosch type	
Fuel oil feed pump	Gear type	
Fuel oil filter	Gauze wire type	
Lubricating oil pump	Gear type	
Lubricating oil cooler	Multi-tube type	
Lubricating oil filter	Gauze wire/Notched wire type	
Lubricating oil sump tank	Integral with common bed or separate	
Cooling water pump	Centrifugal type	
Cooling fresh water cooler	Multi-tube type	

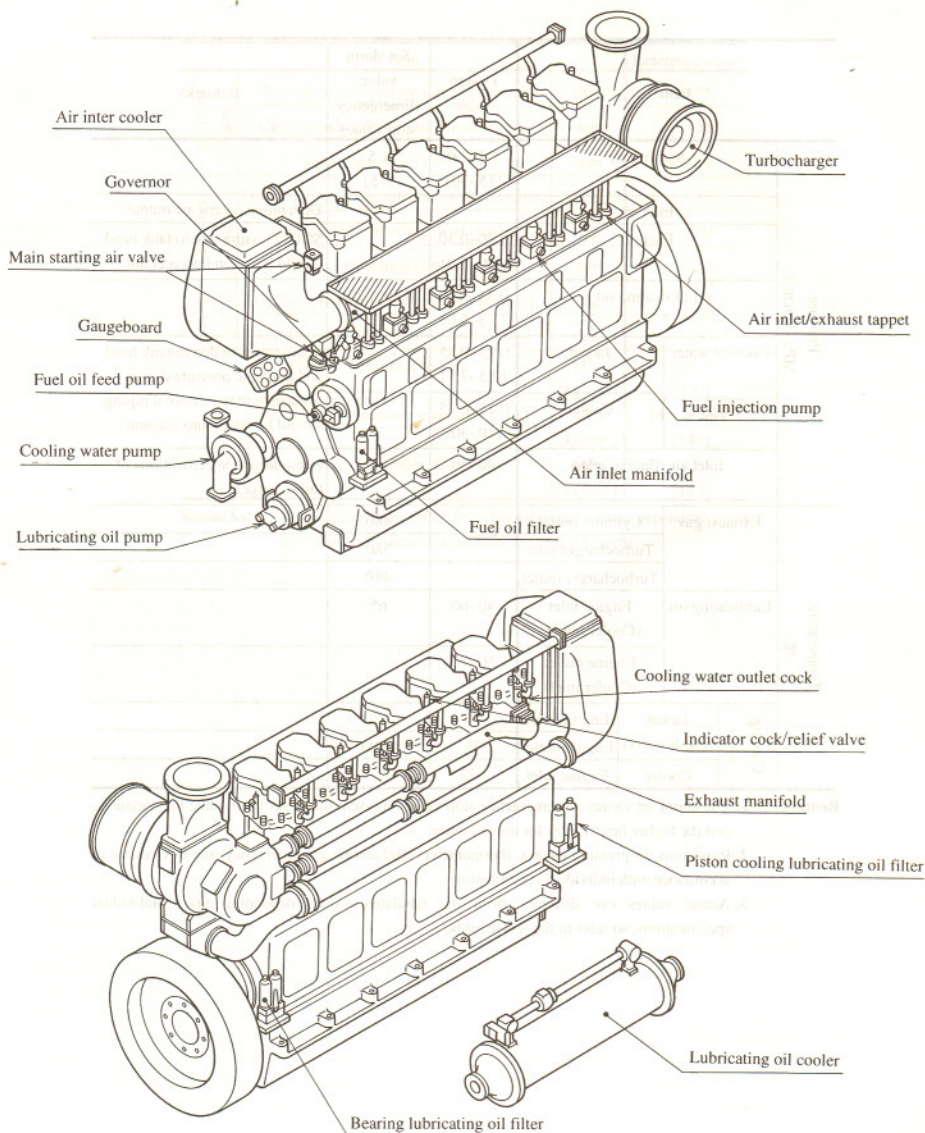
Remarks: Items shown in the table represent those conforming to standard specifications.

Actual arrangements can differ from the tabulated ones depending upon the specifications concerned, and it is suggested that the test record be referred to.

Engine outline	Engine model	I-1
Sectional view	DE28	2



Engine outline	Engine model	I-1
Outline • Equipment arrangement	DE28	3



Engine adjusting standard	Engine model	I-2
Operating data	DE28	2

Item			Design value	Set alarm value (Emergency stop value)	Remarks
Pressure MPa {kg/cm ² }	Starting air		1.5~3.0 {15~30}	1.5 {15}	
	Inlet air				Depending on engine output
	Fuel oil		0.20~0.30 {2.0~3.0}		Static pressure due to tank head should be taken into account.
	Lubricating oil		0.35~0.50 {3.5~5.0}	0.30(0.25) 3.0{(2.5)}	
	Cooling water	Jacket	0.25~0.35 {2.5~3.5}		Static pressure due to tank head and dynamic pressure due to resistance in the external piping should be taken into account.
		Cooler	0.25~0.35 {20~30}		
	Inlet air (Engine inlet)		40~50		According to specifications of turbocharger
Temperature °C	Exhaust gas	Cylinder outlet		480	
		Turbocharger inlet		580	
		Turbocharger outlet		480	
	Lubricating oil	Engine inlet (Cooler outlet)	40~60	65	
		Engine outlet (Cooler inlet)	50~70		
	Cooling water	Jacket (Fresh water) Engine inlet	70	80	
		Engine outlet	75	85(90)	
	Cooler	Engine inlet	~32		

- Remarks :**
1. The alarm set values and emergency stop value represent the lower limit value for pressures, and the higher limit values for temperatures.
 2. Provisions for pressure gauges, thermometers, and alarms and emergency stop devices are in accordance with individual specifications.
 3. Actual values can differ from the tabulated values depending upon individual specifications, so refer to the test records.

