L28/32H Fuel oil system

L 28/32-23/30 Fuel oil system

MAN four-stroke diesel engines can be operated with any heavy fuel oil obtained from crude oil that also satisfies the requirements in the table next slide, providing the engine and fuel processing system have been designed accordingly.

To ensure that the relationship between the fuel, spare parts and repair / maintenance costs remains favorable at all times, the following points should be observed.

L 28/32-23/30 Fuel oil system

General

The internal built-on fuel oil system consists of the following parts:

- the running-in filter
- the high-pressure injection equipment
- the waste oil system

Running-in filter

The running-in filter has a fineness of 50 microns and is placed in the fuel inlet pipe. Its function is to remove impurities in the fuel pipe between safety filter and the engine in the running-in period.

Note: The filter must be removed before ship delivery or before handling over to the customer.

It is advised to install the filter every time the extern fuel pipe system has been dismantled, but it is important to remove the filter again when the extern fuel oil system is considered to be clean for any impurities.

L 28/32-23/30 Fuel oil system

Fuel injection equipment

Each cylinder unit has its own set of injection equipment comprising injection pump unit, high-pressure pipe and injection valve.
The injection equipment and the distribution supply pipes are housed in a fully enclosed compartment thus minimizing heat losses from the preheated fuel.This reduces external surface temperatures and the risk of fire caused by fuel leakage.
The injection pump unit are with integrated roller guide directly above the camshaft.
The fuel quantity injected into each cylinder unit is adjusted by means of the governor, which maintains the engine speed at the preset value by a continuous positioning of the fuel pump racks, via a common regulating shaft and spring-loaded linkages for each pump.
The injection valve is for "deep" building-in to the centre of the cylinder head.
The injection oil is supplied from the injection pump to the injection valve via a double-walled pressure pipe installed in a bore in the cylinder head.
This bore has an external connection to lead the leak oil from the injection valve and high-pressure pipe to the waste oil system, through the double walled pressure pipe.
A bore in the cylinder head vents the space below the bottom rubber sealing ring on the injection valve, thus preventing any pressure build-up due to gas leakage, but also unveiling any malfunction of the bottom rubber sealing ring due to leak oil.

L 28/32-23/30 Fuel oil system

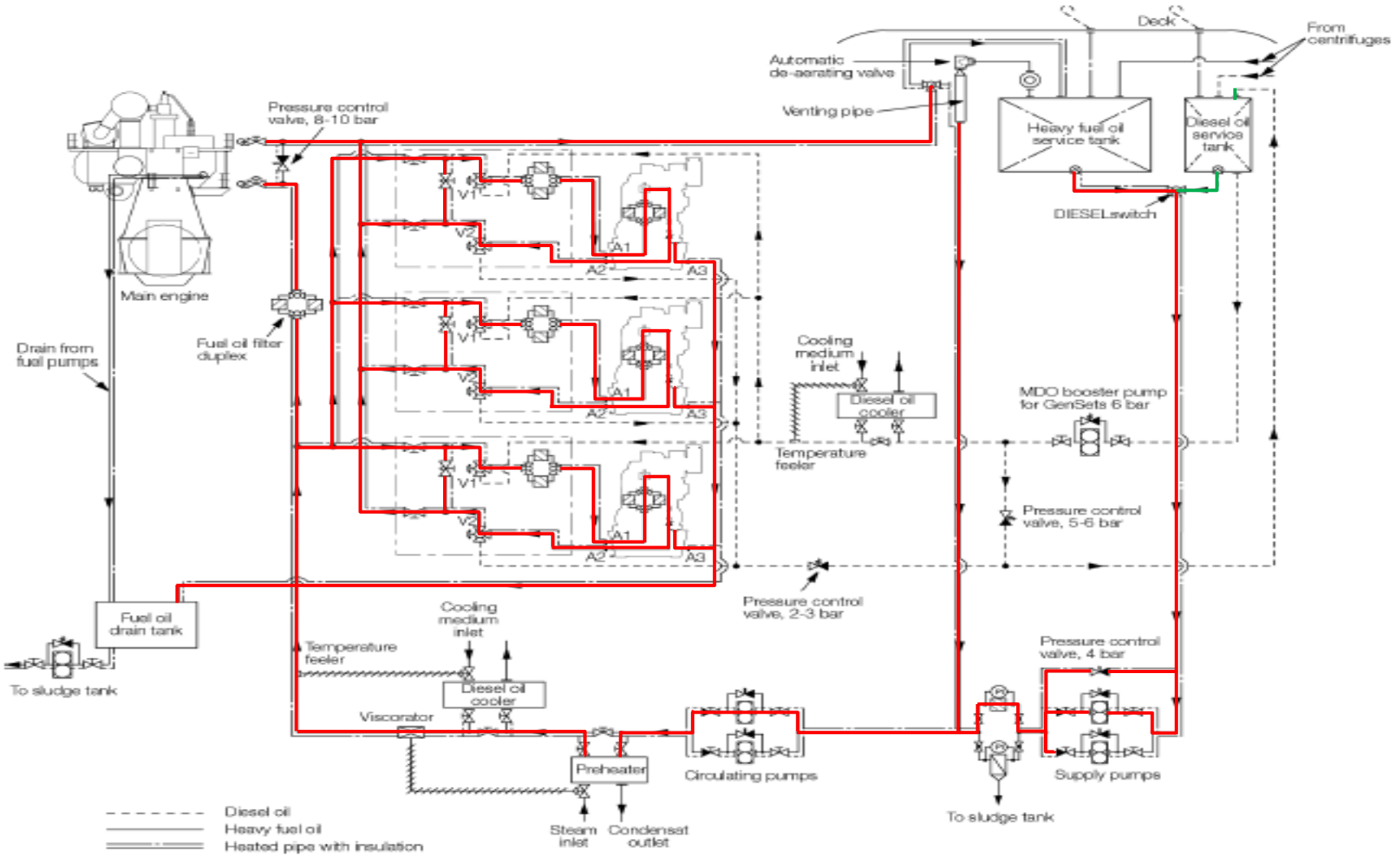
Waste oil system

Waste and leak oil from the hot box, fuel injection valves, fuel injection pumps and high-pressure pipes, is led to the fuel leakage alarm unit, from which it is drained into the sludge tank.
The leakage alarm unit consists of a box, with a float switch for level monitoring. In case of a leakage, larger than normal, the float switch will initiate an alarm. The supply fuel oil to the engine is led through the leakage alarm unit in order to keep this heated up, thereby ensuring free drainage passage even for high-viscous waste/leak oil.

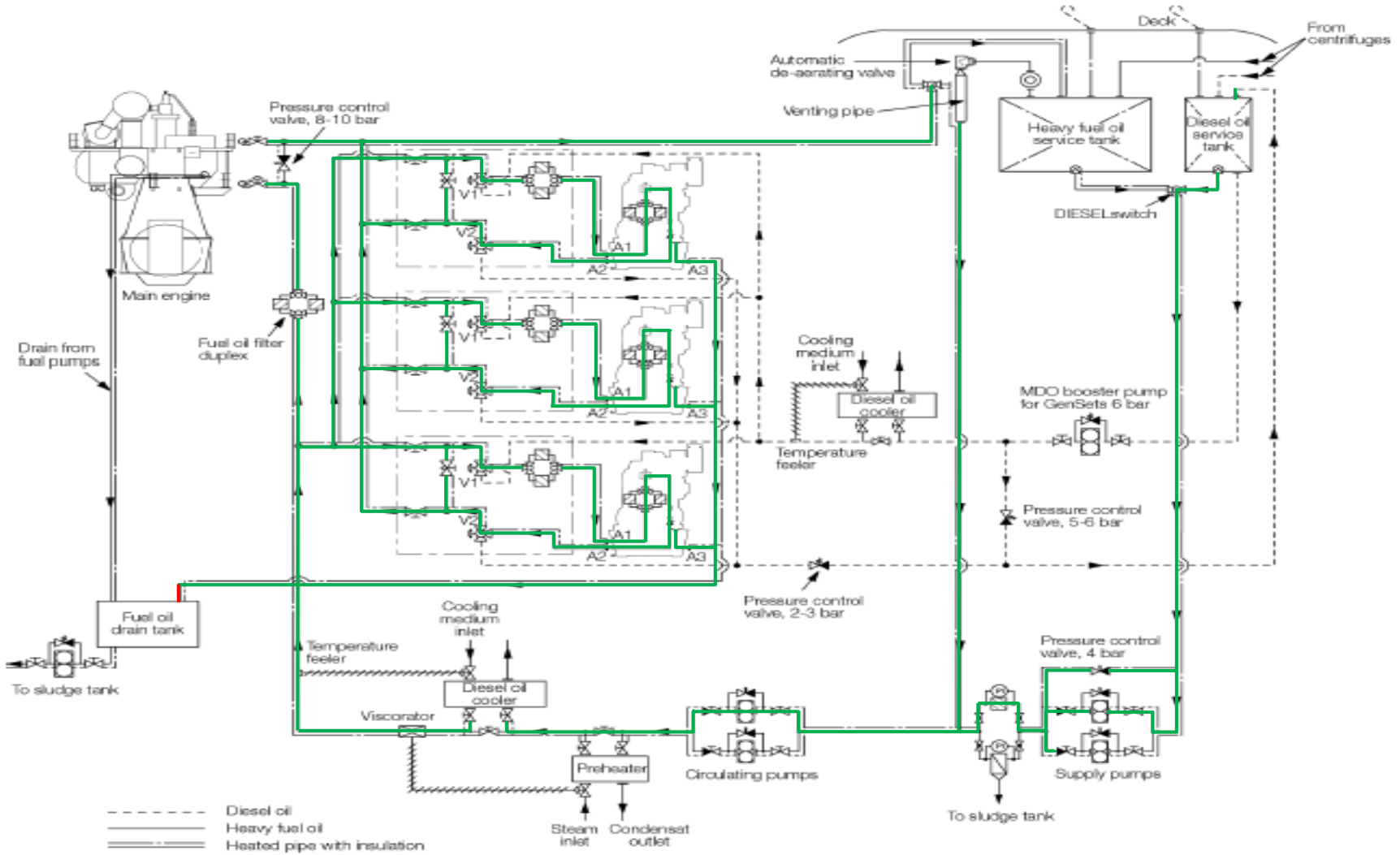
Sludge tank

In normal operation no fuel should leak out from the components of the fuel system. In connection with maintenance, or due to unforeseen leaks, fuel or water may spill in the hot box of the engine. The spilled liquids are collected and drained by gravity from the engine through the dirty fuel connection.
Waste and leak oil from the hot box is drained into the sludge tank.
The tank and the pipes must be heated and insulated, unless the installation is designed for operation exclusively on MDO/MGO.

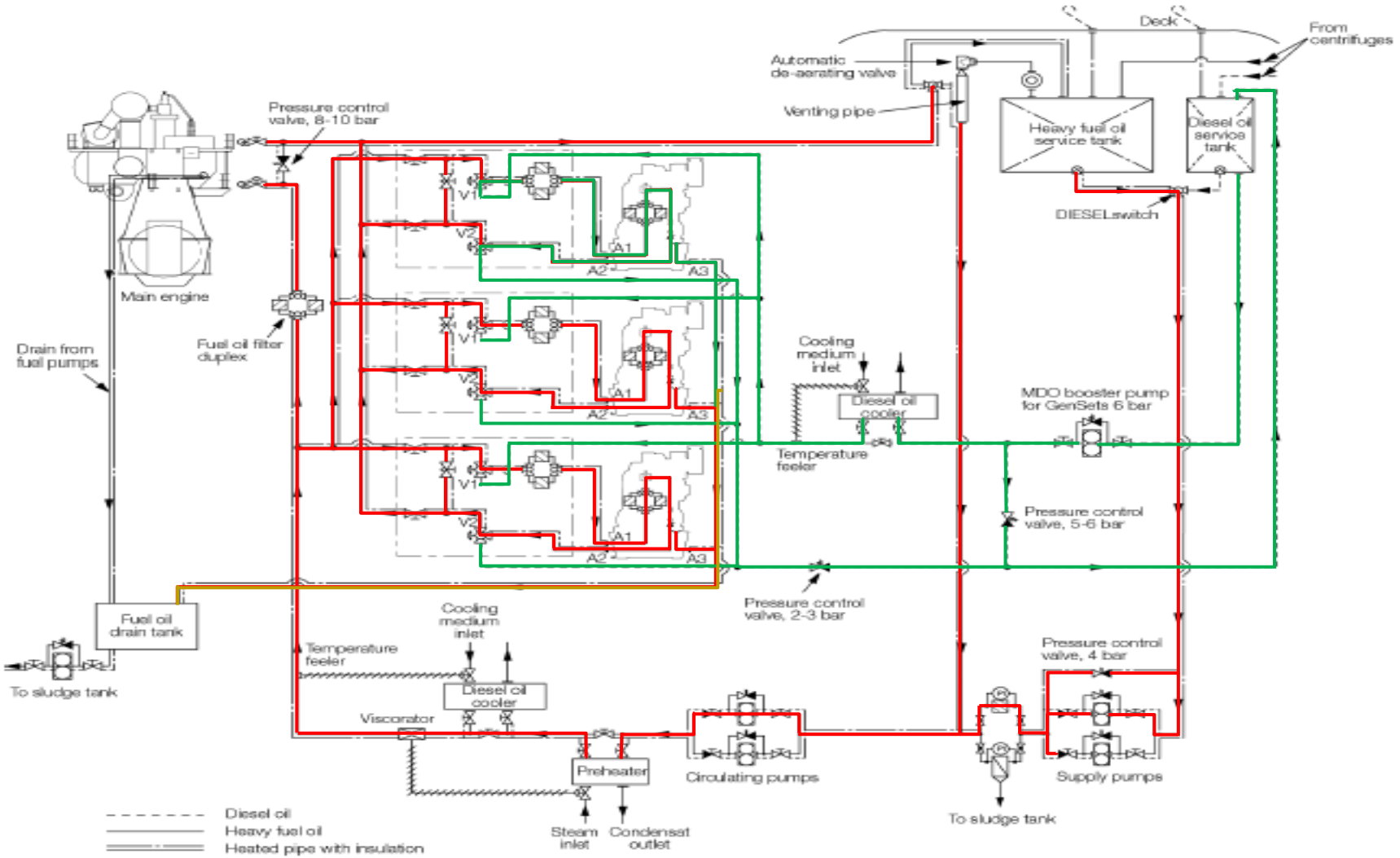
Fuel system – Uni-fuel – HFO Operation



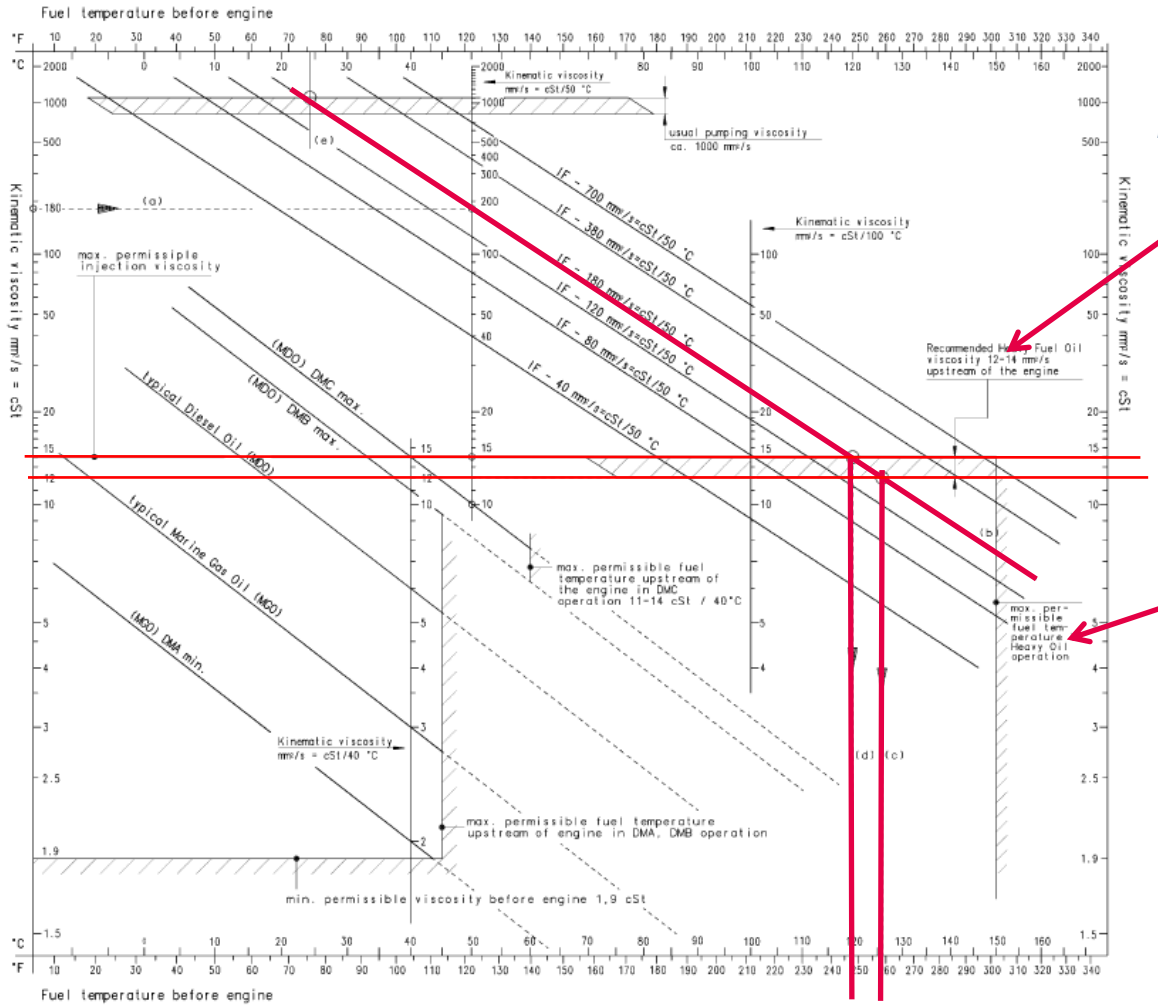
Fuel system – Uni-fuel – MDO Operation



Fuel system – Uni-fuel – MDO Single engine



L28/32H Fuel oil system- viscosity



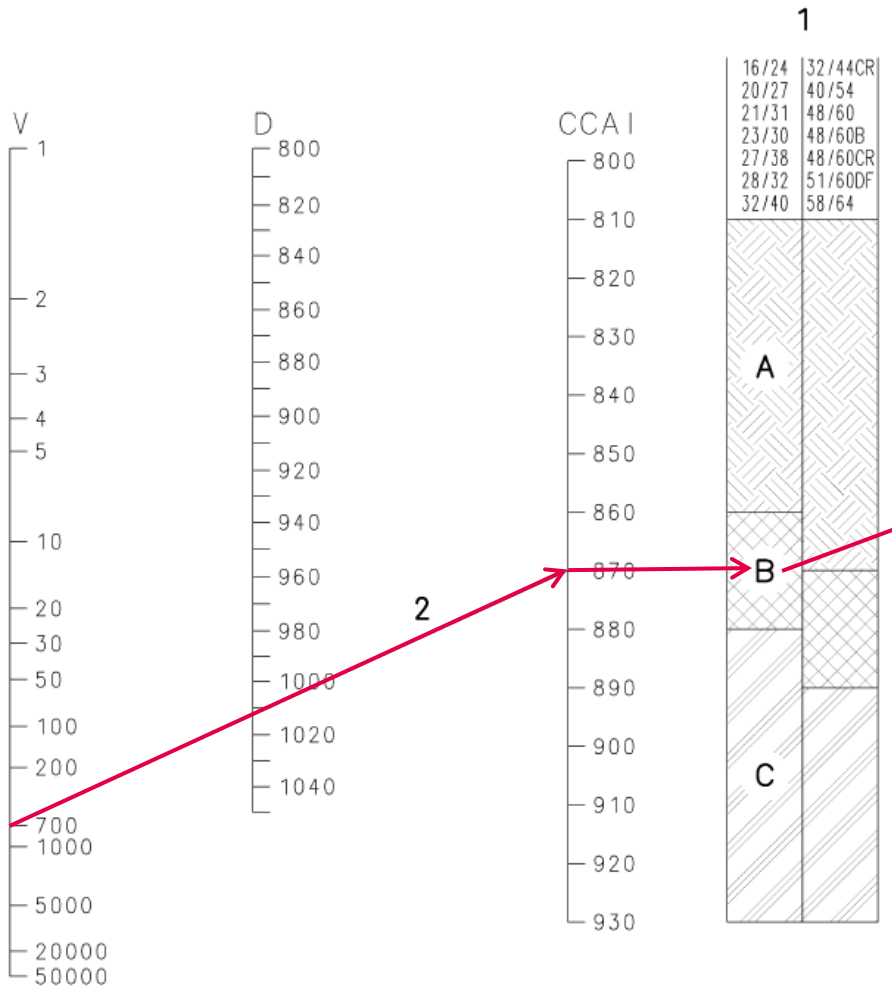
Example: Heavy fuel oil with 180 mm²/s at 50 °C

Recommended Heavy Fuel Oil viscosity 12-14 mm²/s upstream of the engine

max. permissible fuel temperature in Heavy Oil operation

Prescribed injection viscosity in mm²/s	Required temperature of heavy fuel oil at engine inlet* in °C
≥ 12	126 (line c)
≤ 14	119 (line d)

L16/24 Fuel oil system



V Viscosity in mm²/s (cSt) at 50° C
D Density [in kg/m³] at 15° C

CCAI Calculated Carbon Aromaticity Index

1 Engine type

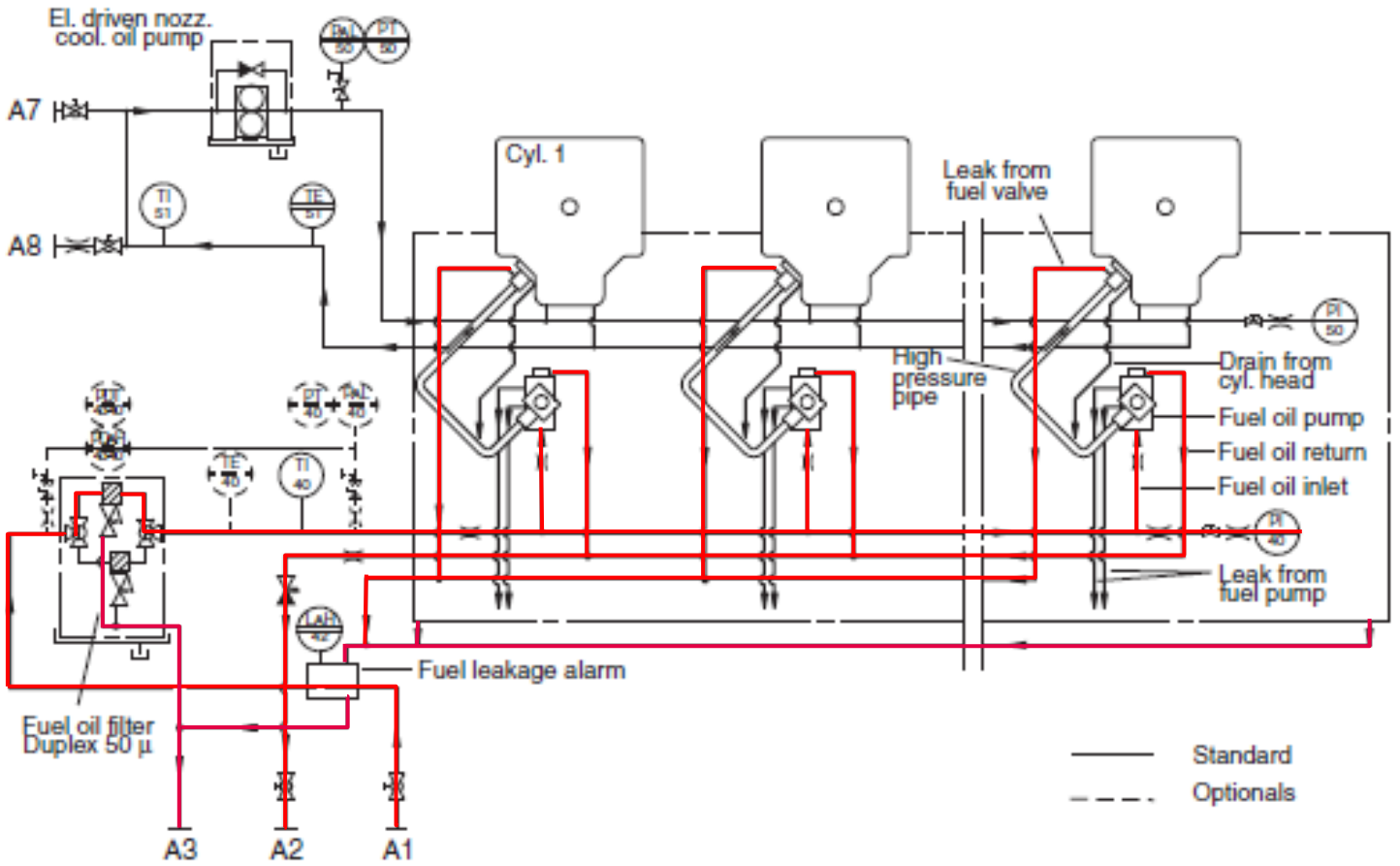
A Normal operating conditions
B The ignition characteristics can be poor and require adapting the engine or the operating conditions.
C Problems identified may lead to engine damage, even after a short period of operation.
2 The CCAI is obtained from the straight line through the density and viscosity of the heavy fuel oils.

Figure 4: Nomogram for determining the CCAI – assigning the CCAI ranges to engine types

The CCAI can be calculated using the following formula:

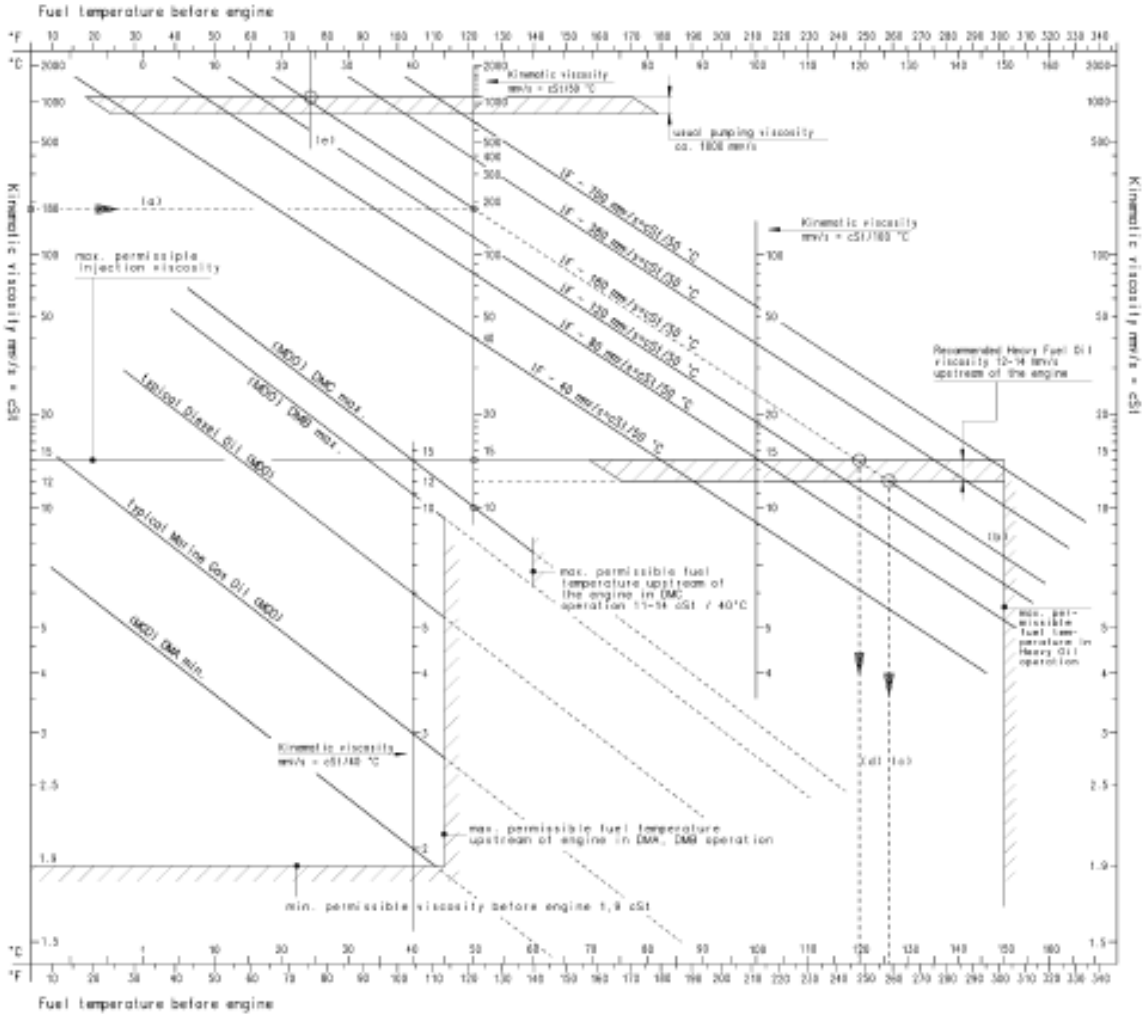
$$CCAI = D - 141 \log\log (V+0.85) - 81$$

L16/24 Fuel oil system

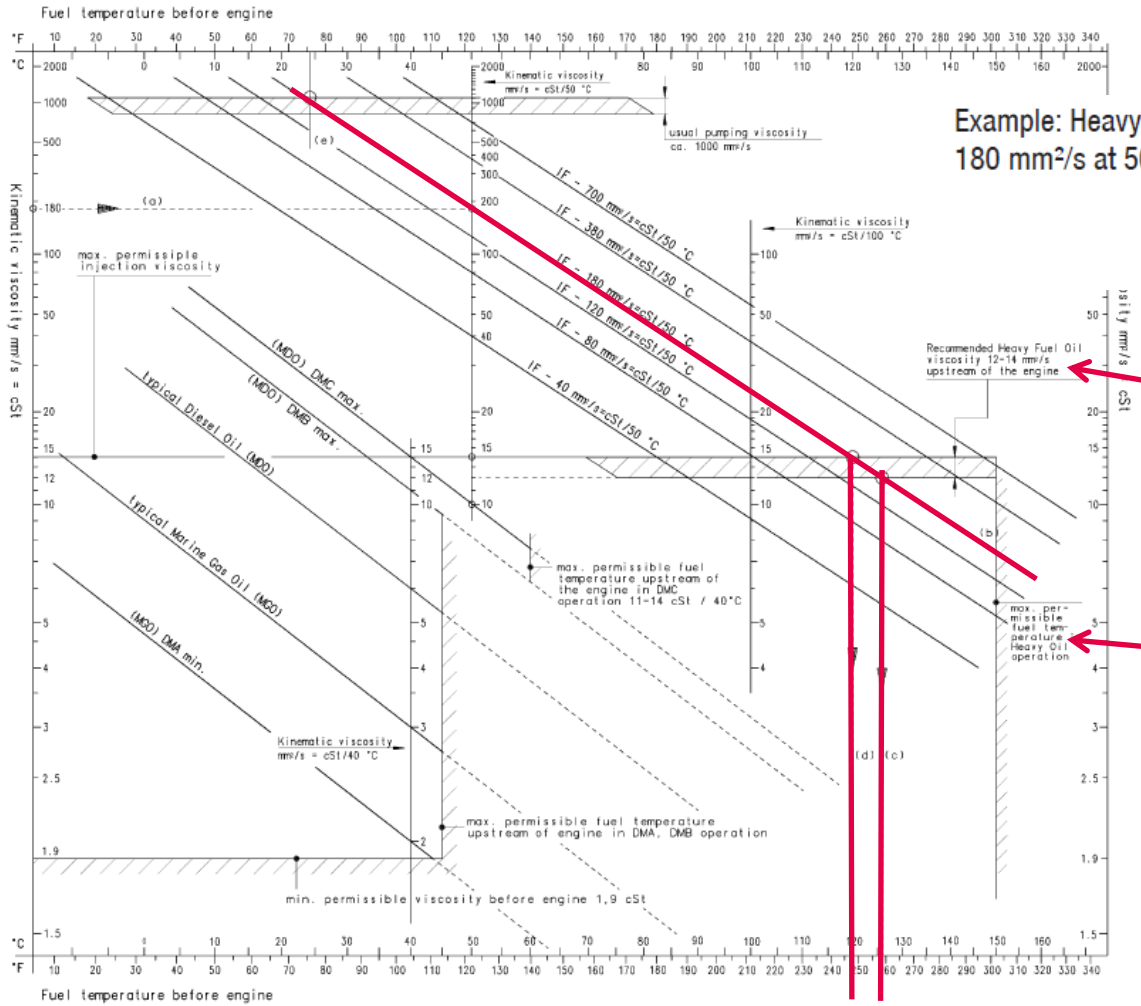


L28/32H Fuel oil system

- HFO 750 Cst
- Temp inlet engine max. 150ºC



L28/32H Fuel oil system- viscosity



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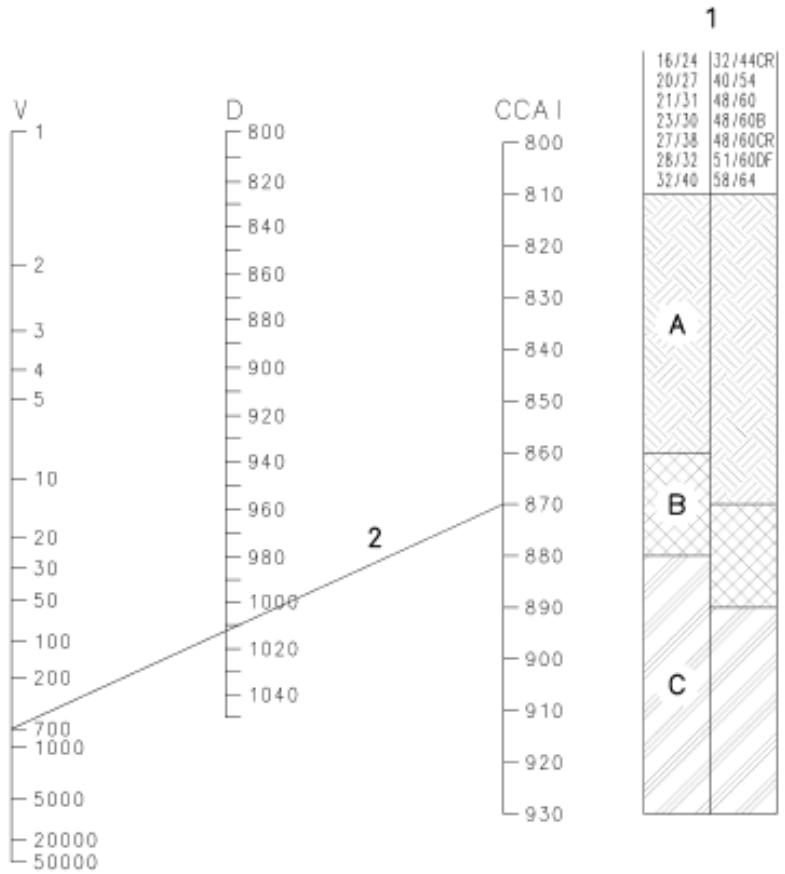
max. permissible fuel temperature in Heavy Oil operation

L28/32H Fuel oil system



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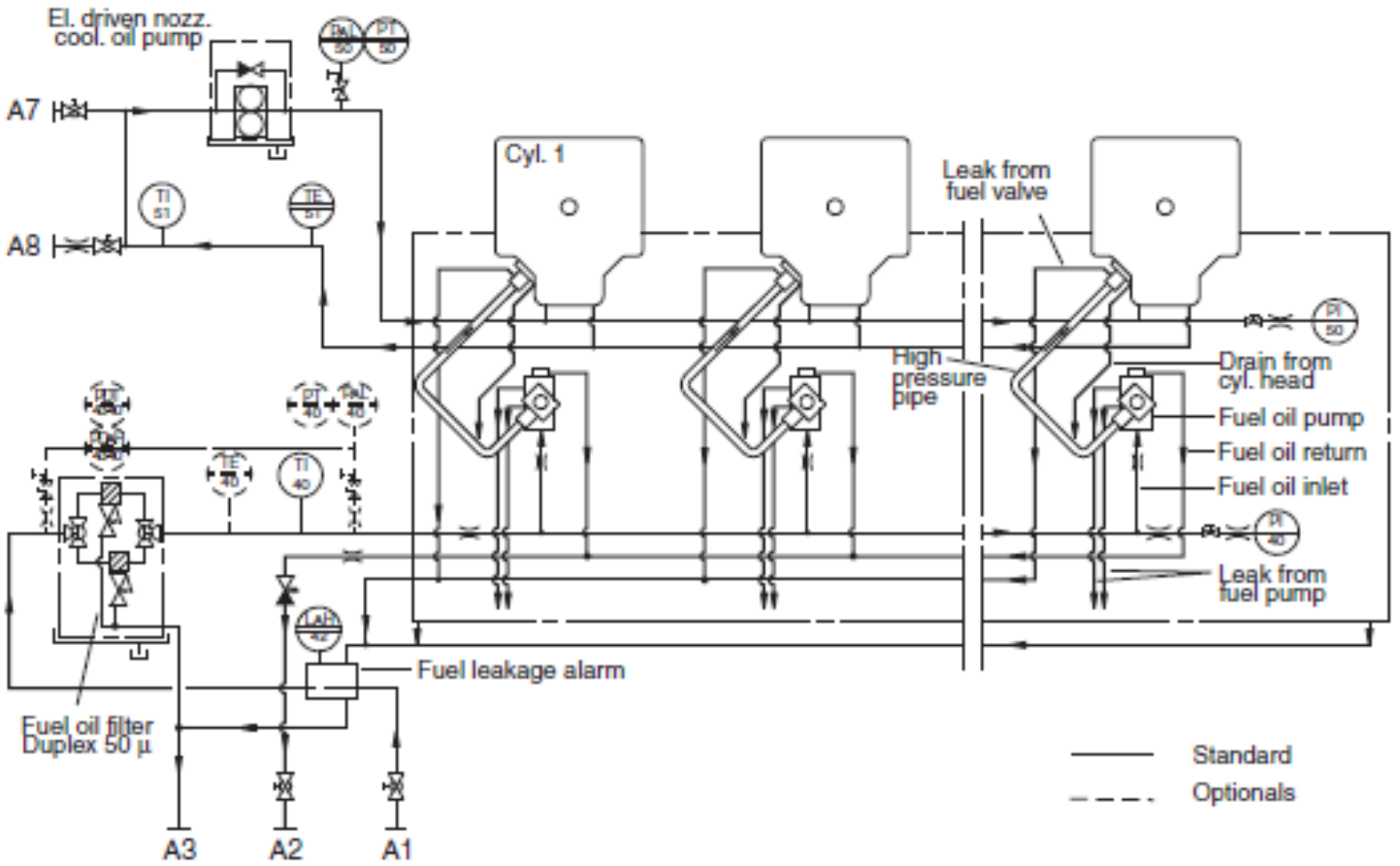
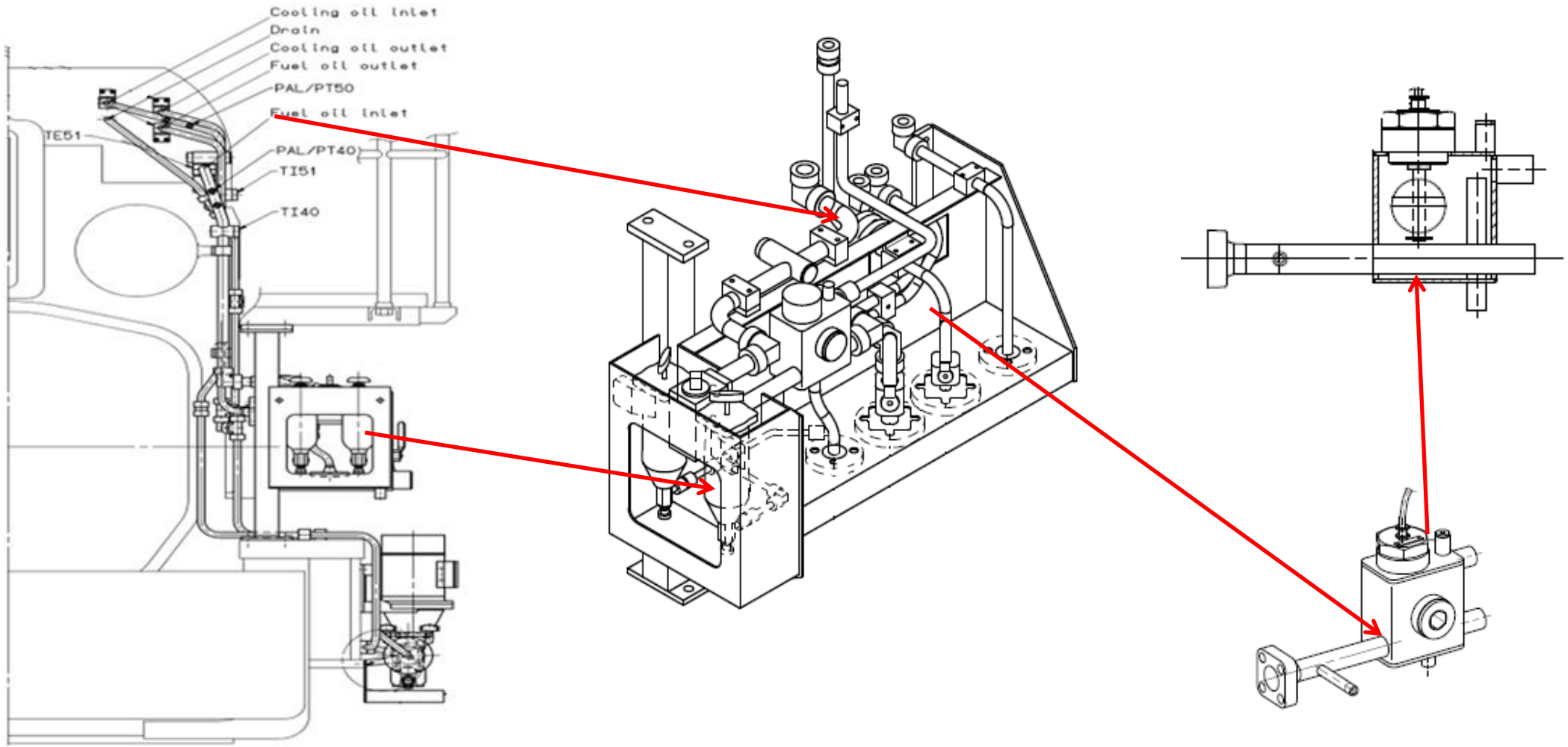
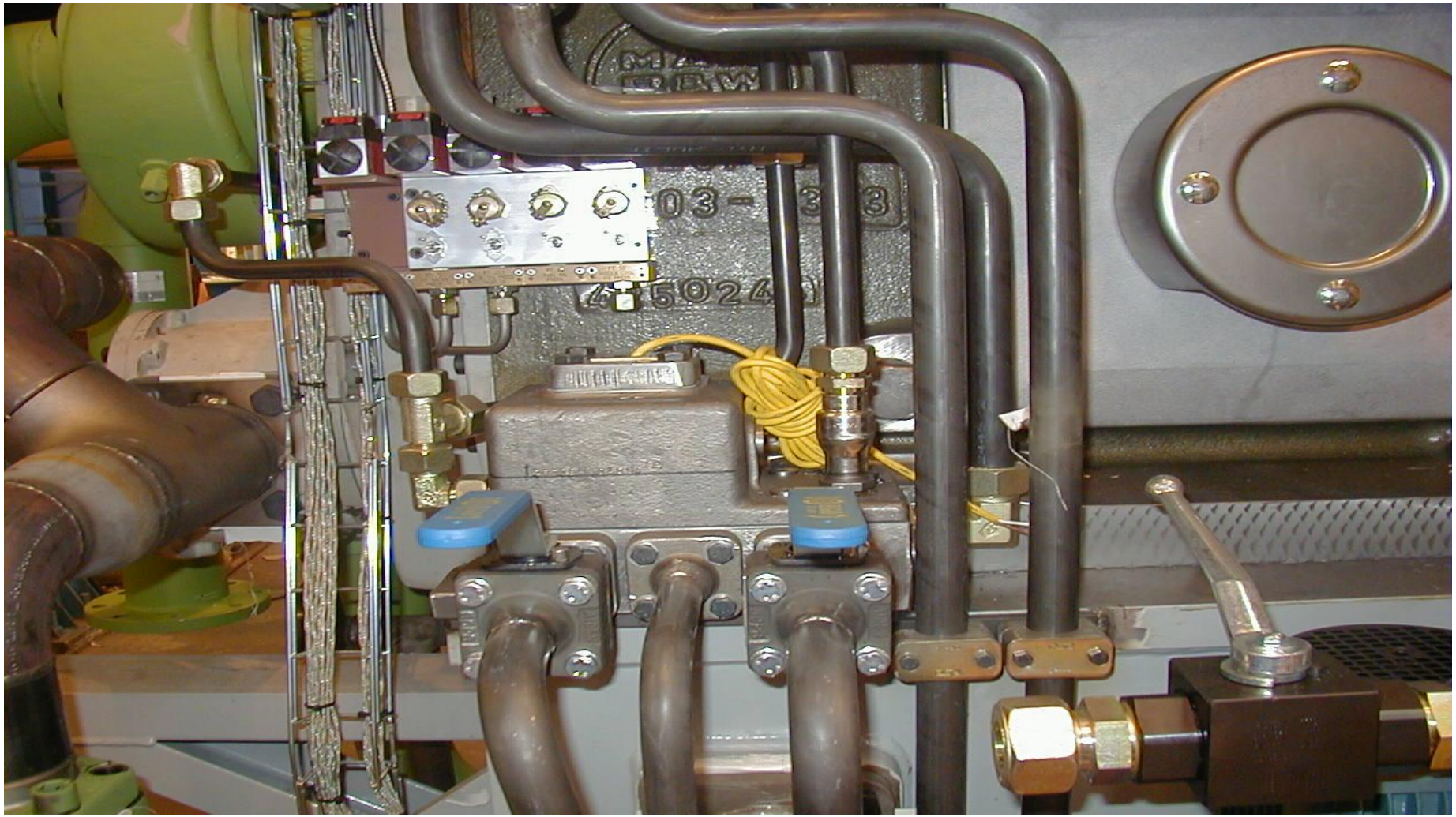


L28/32H Fuel oil system

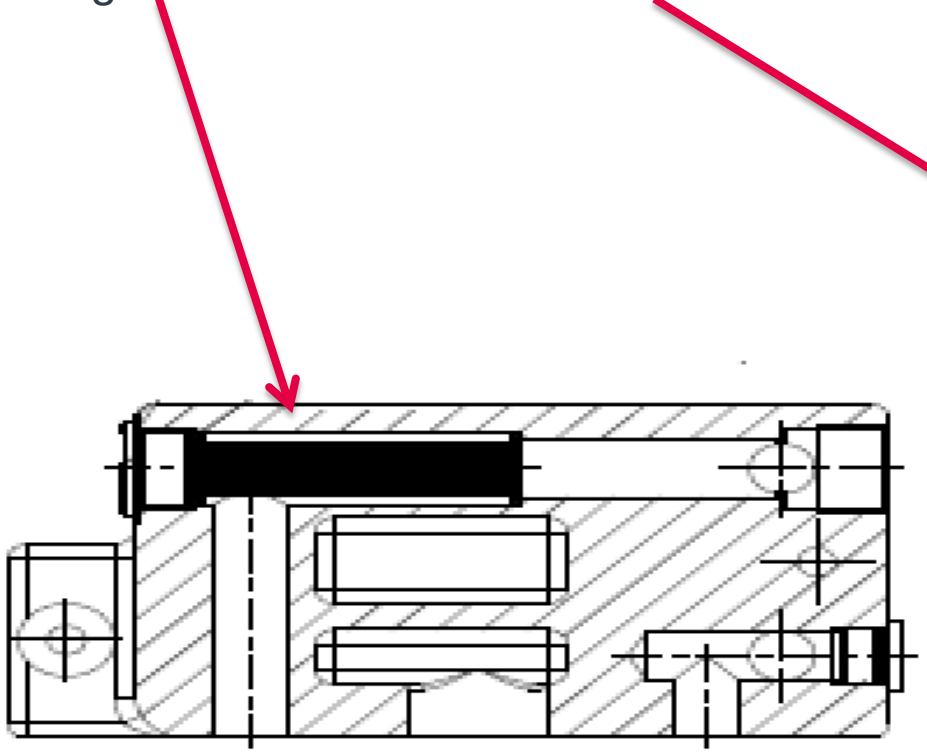


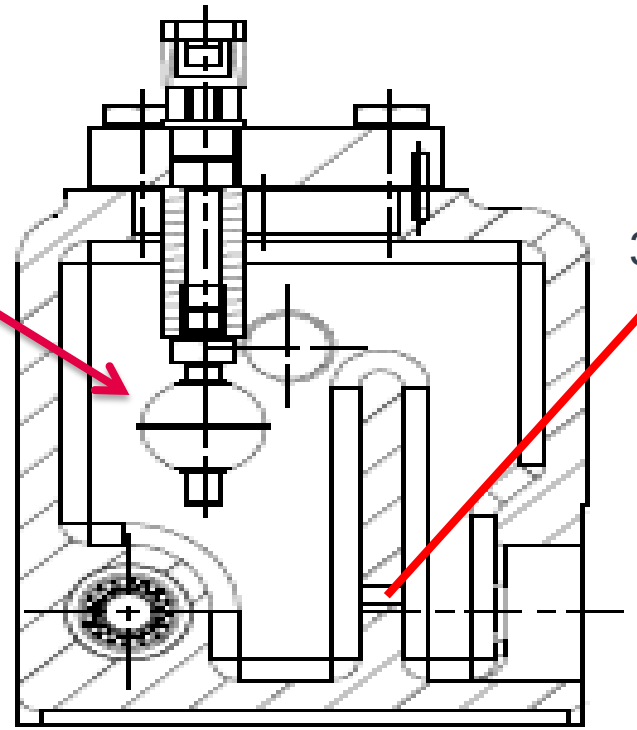
L28/32H Fuel oil system



Filter and drain box Fuel oil leak alarm

Commissioning filter and alarm for drain box





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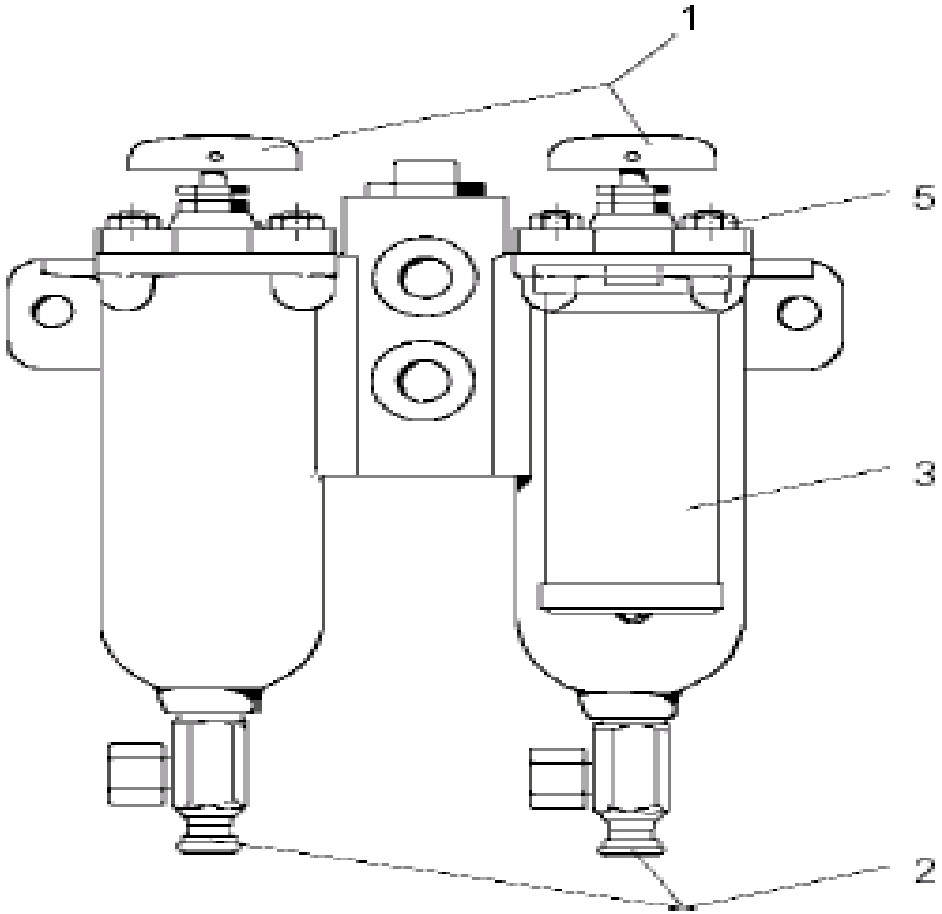

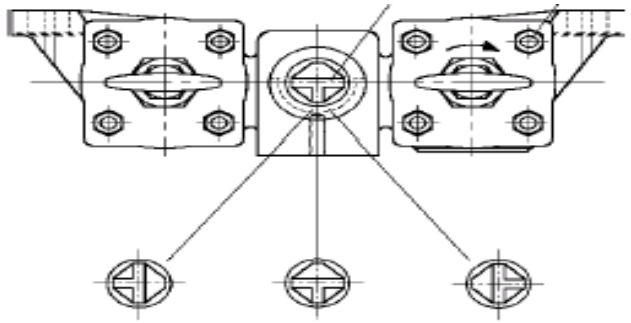

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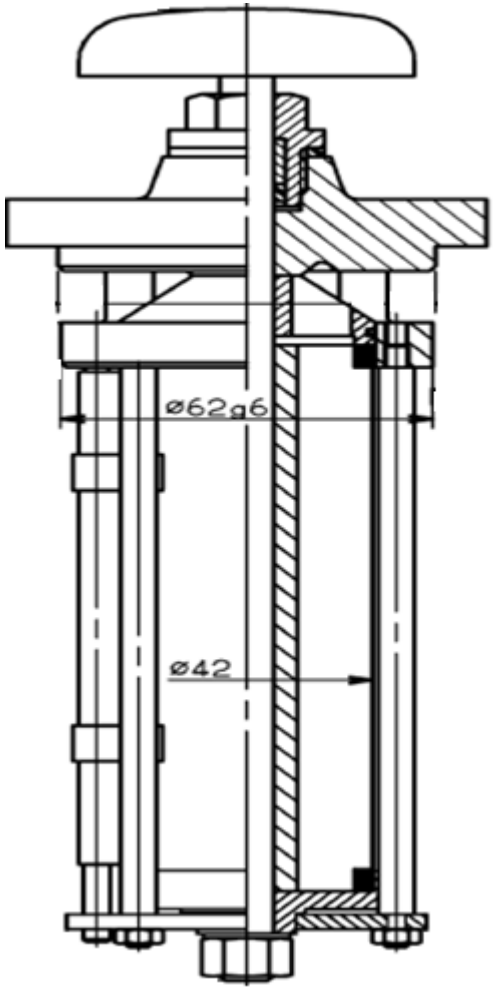

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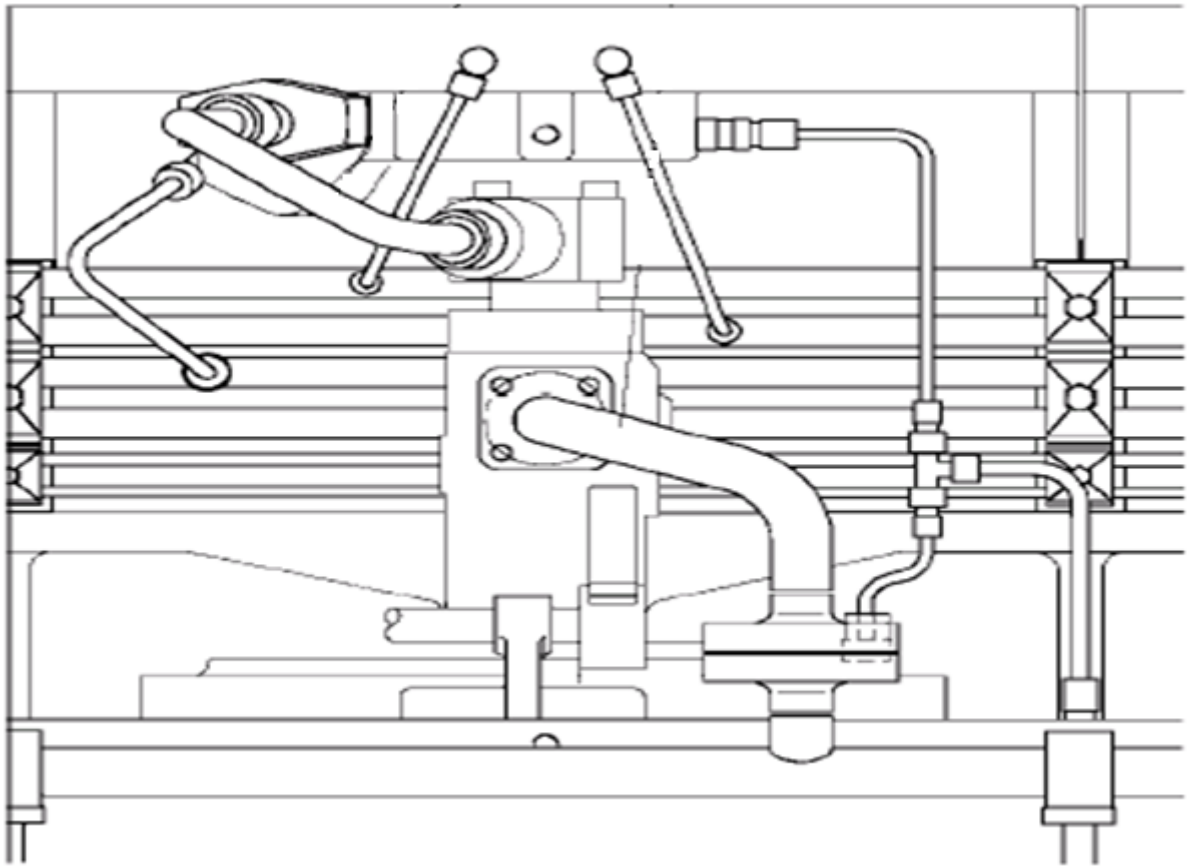

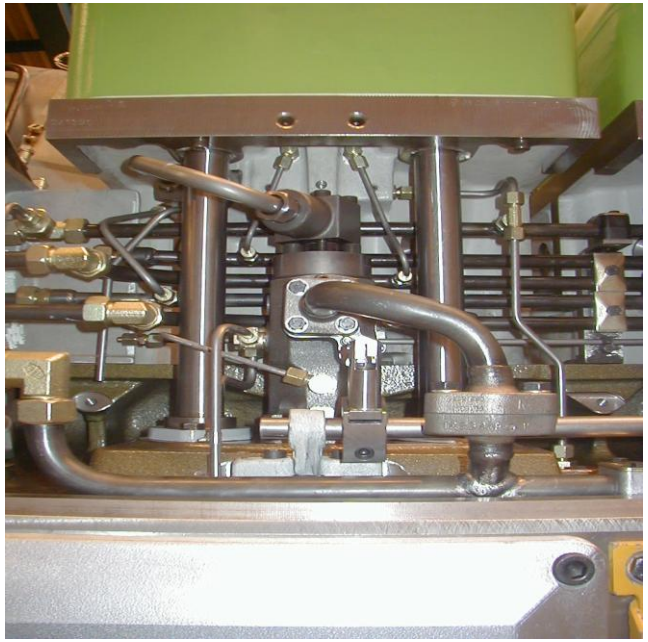

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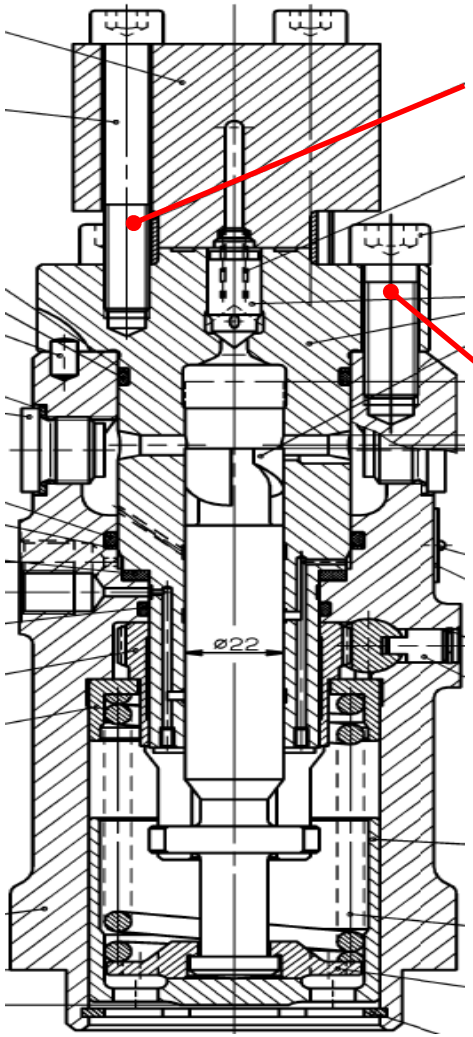
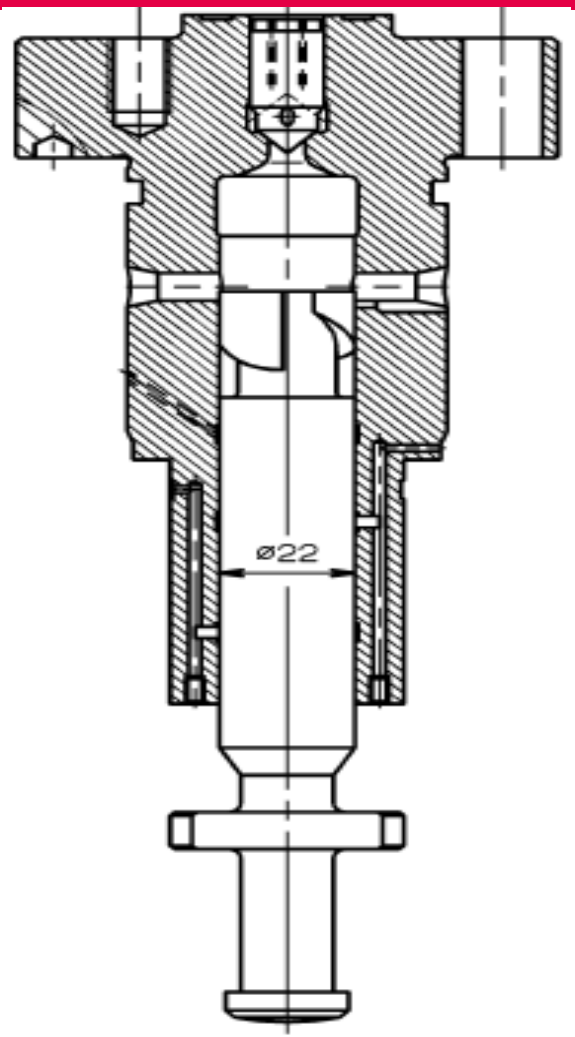


Tightening specification:

1. Pressing the connection piece down,position the screws by hand.
2. Using an Inbus-spanner, tighten the screws hand-tight crosswise.
3. Tightening crosswise in 3 stages-20-40-60 Nm.

Tightening torque: 100Nm



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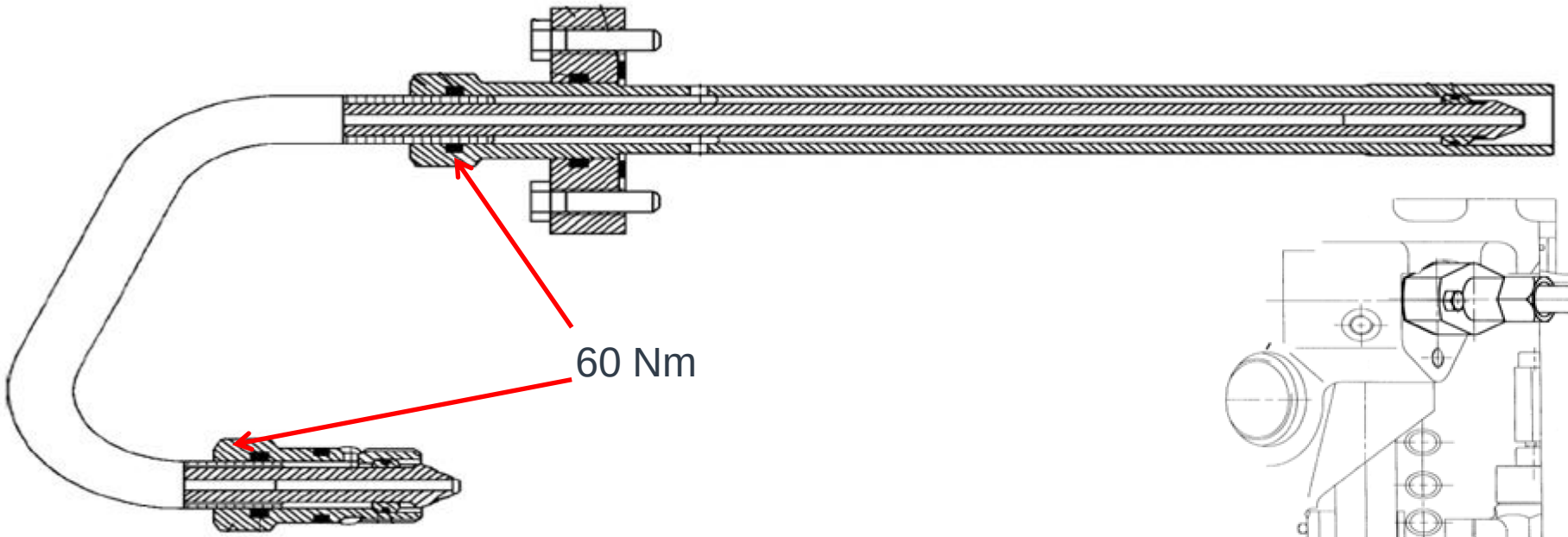

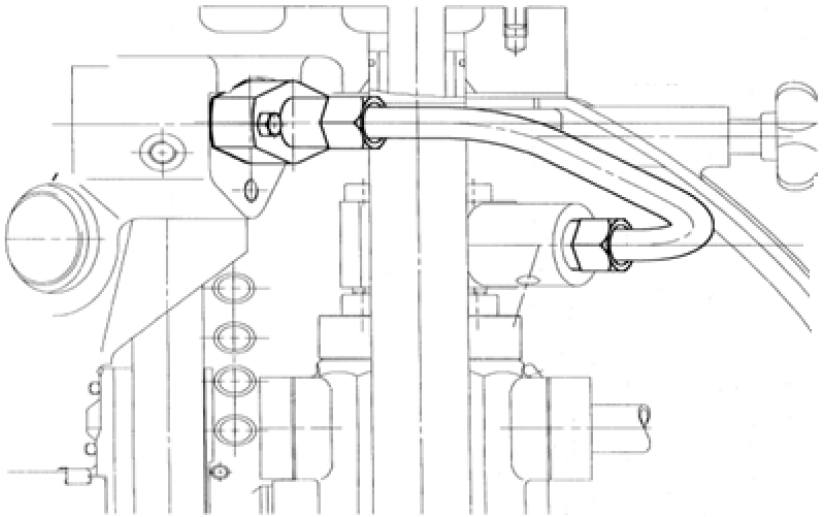

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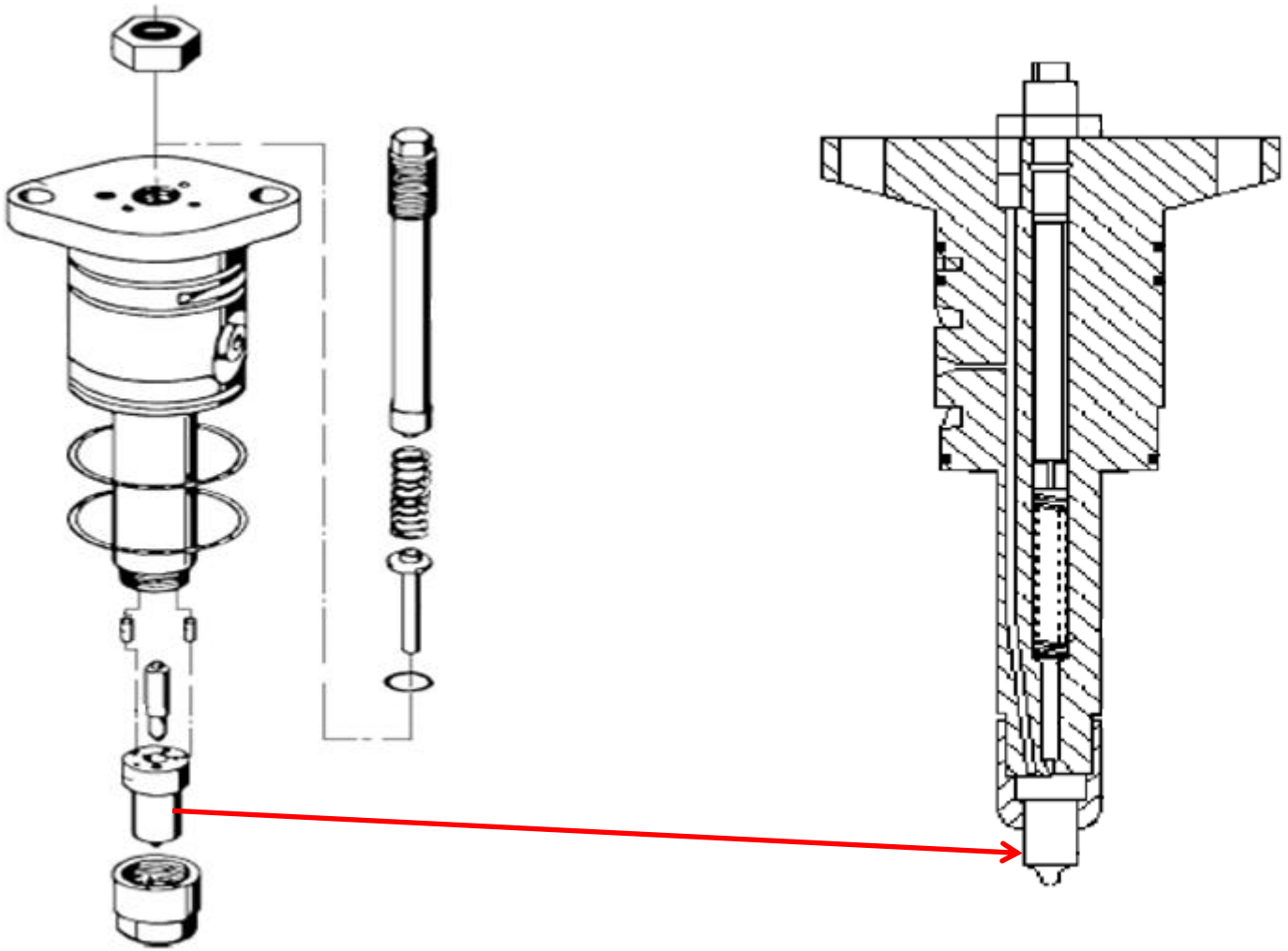

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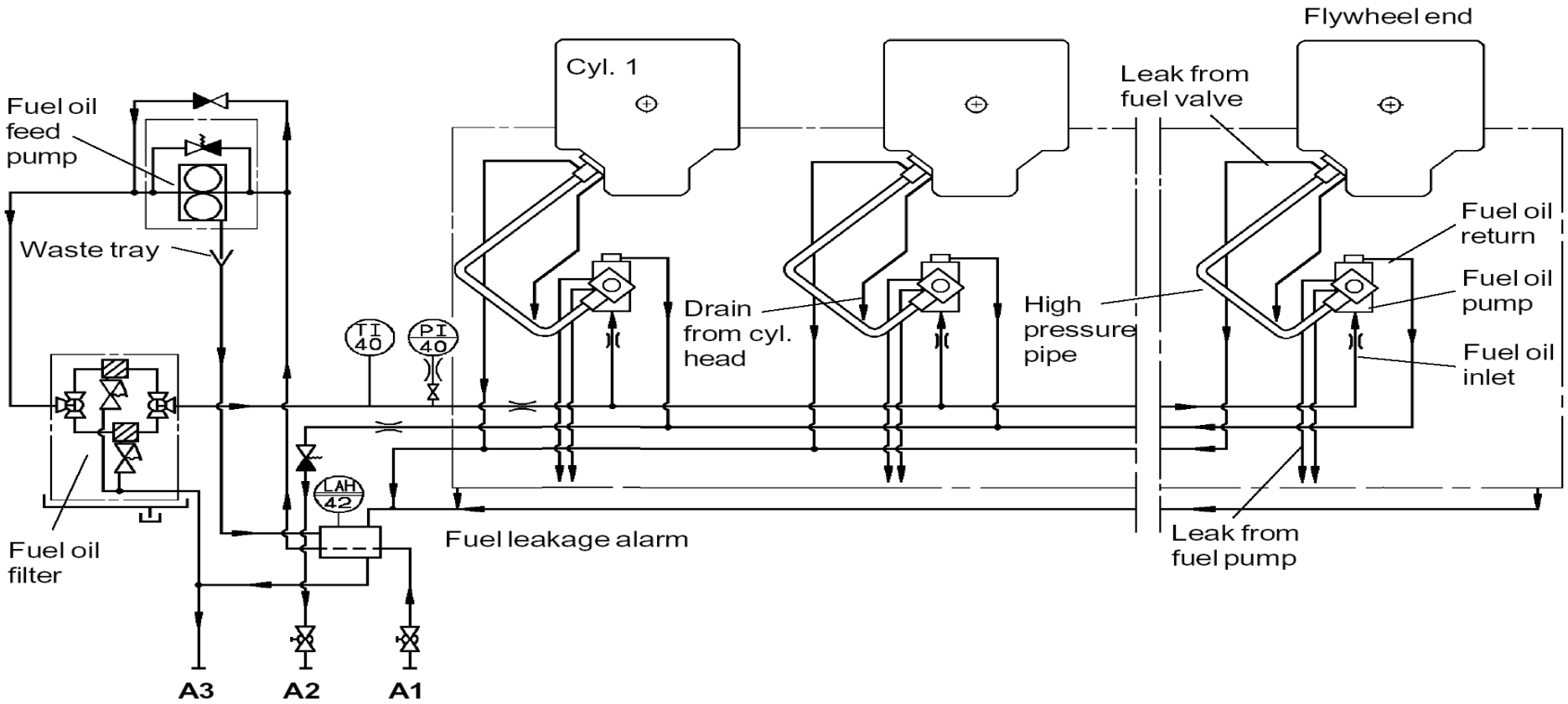

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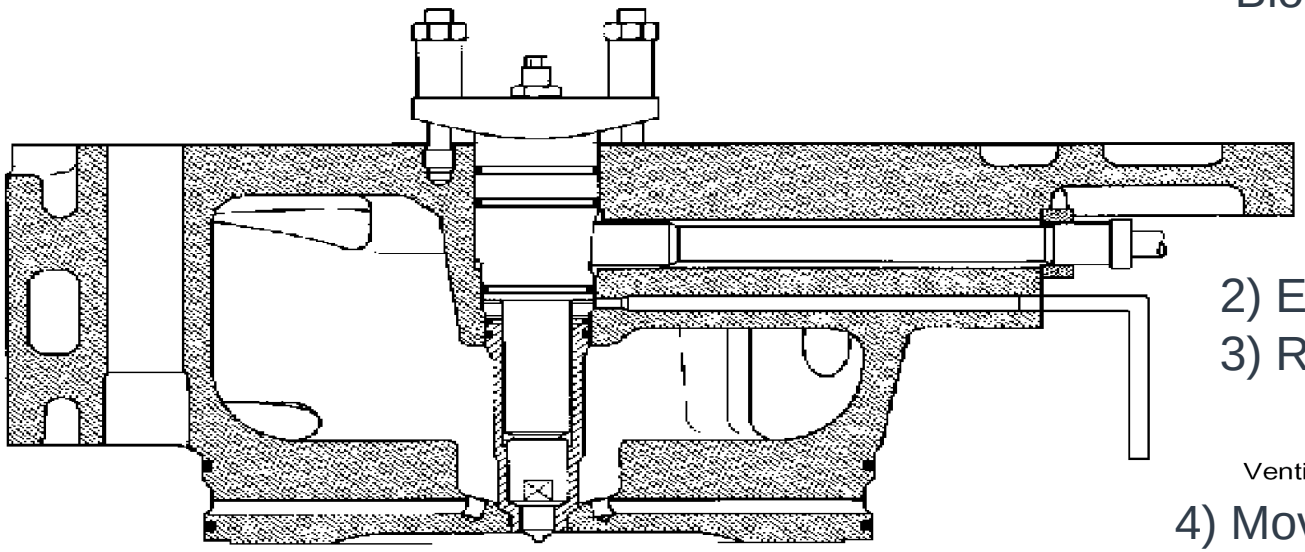


1) Dismount the covers to the injection pumps.
Blow through drain pipes.

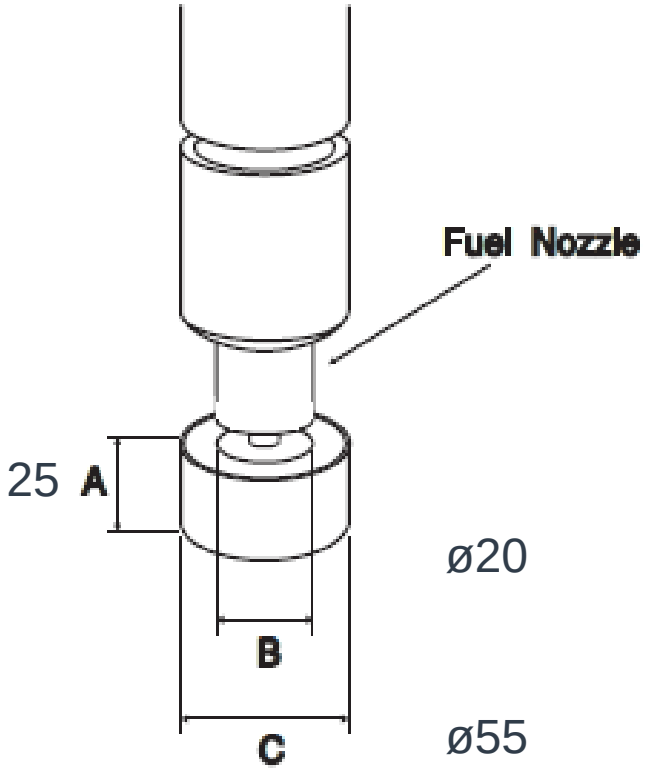
2) Examine the piping system for leaks.
3) Retighten all bolts and nuts in the piping system.

Venting pipe

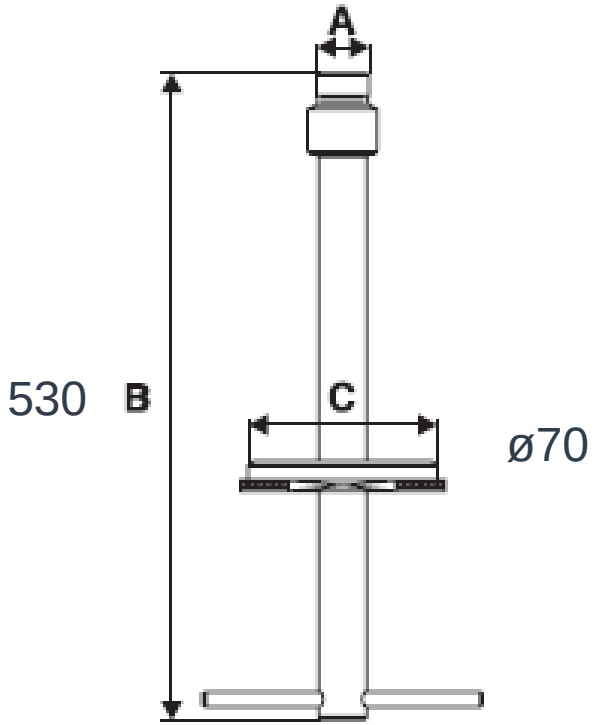
4) Move all valves and cocks in the piping system.
Lubricate valve spindles with graphite or similar.
5) Check flexible connections for leaks and damages.
6) Check the condition of the lower O-ring for the fuel injecting valves by means of the venting pipe.

L28/32H Fuel oil system

Grinding tool for fuel injection valve.



Grinding tool for seat for fuel injection valve.



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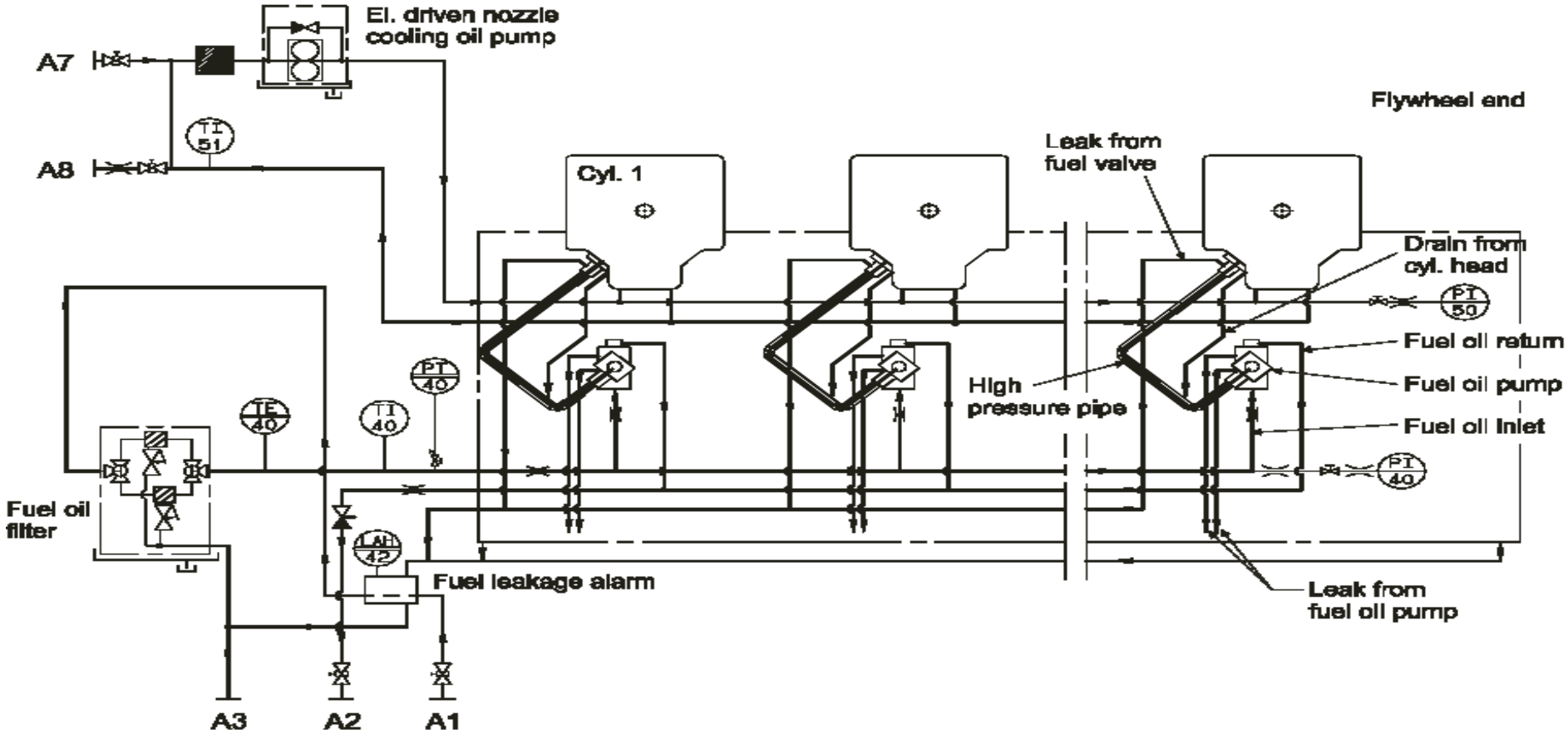

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Do you have any more questions?

Joe Bloggs
[Contact details]

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