MAN Energy Solutions
Future in the making

ME-C HCU components

PrimeServ Academy Copenhagen

MAN PrimeServ

Learning objectives

Upon completion of this module you …

– will be able to recognize the various components in the HCU system.

– will be able to explain the HCU components.

Agenda

Components

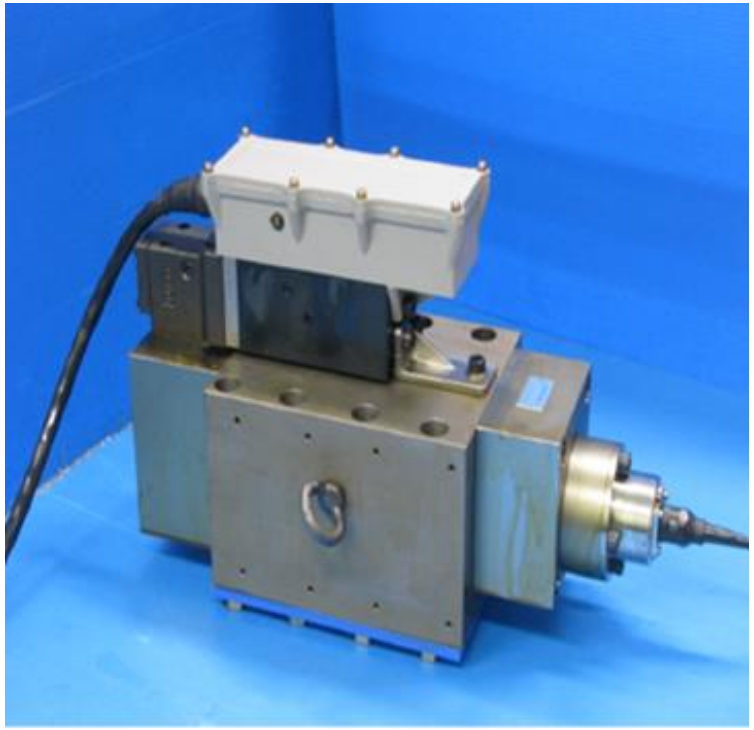
1. **FIVA**
2. **Fuel oil pressure booster**
3. **Exhaust valve**
   - Actuator
   - Designs

Components

Fuel Injection Valve Actuation (FIVA)

MAN FIVA

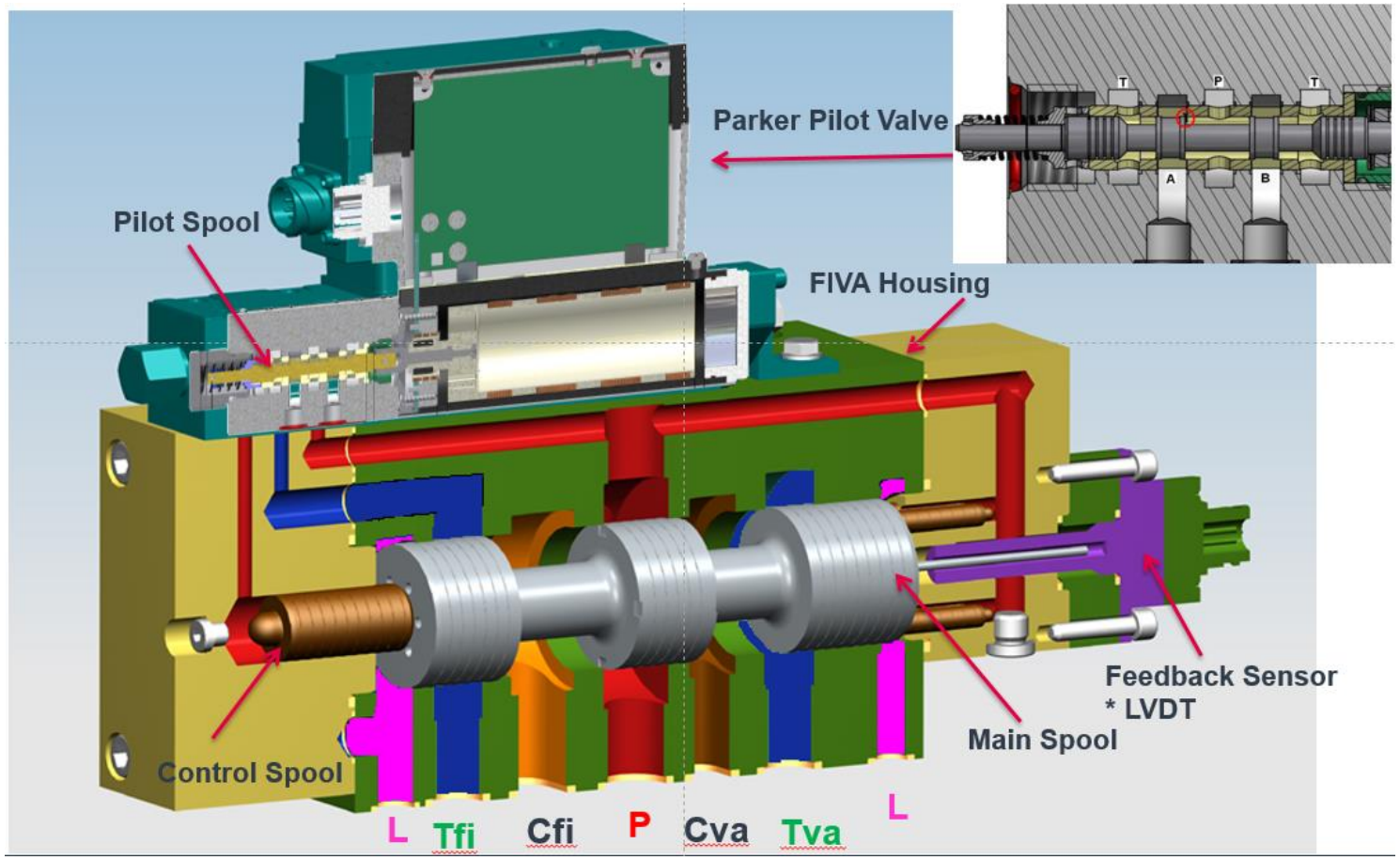
Bosch Rexroth



Nabtesco

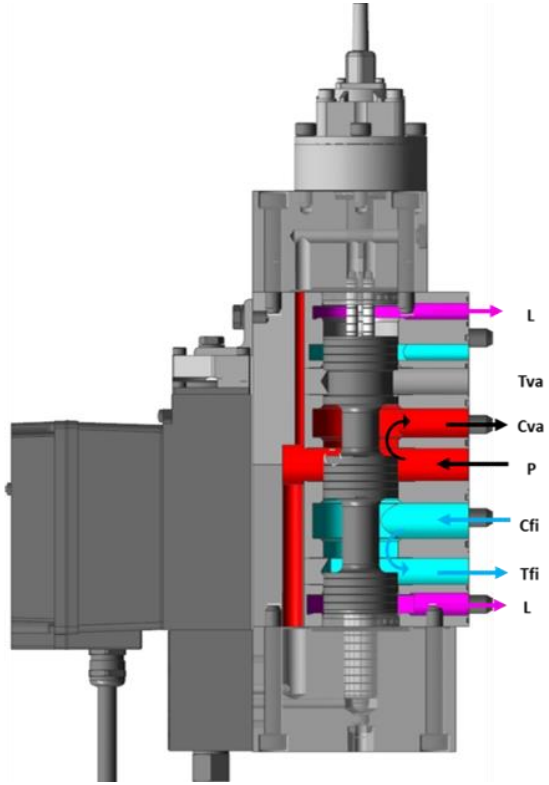
Components

FIVA – MAN - ES FIVA

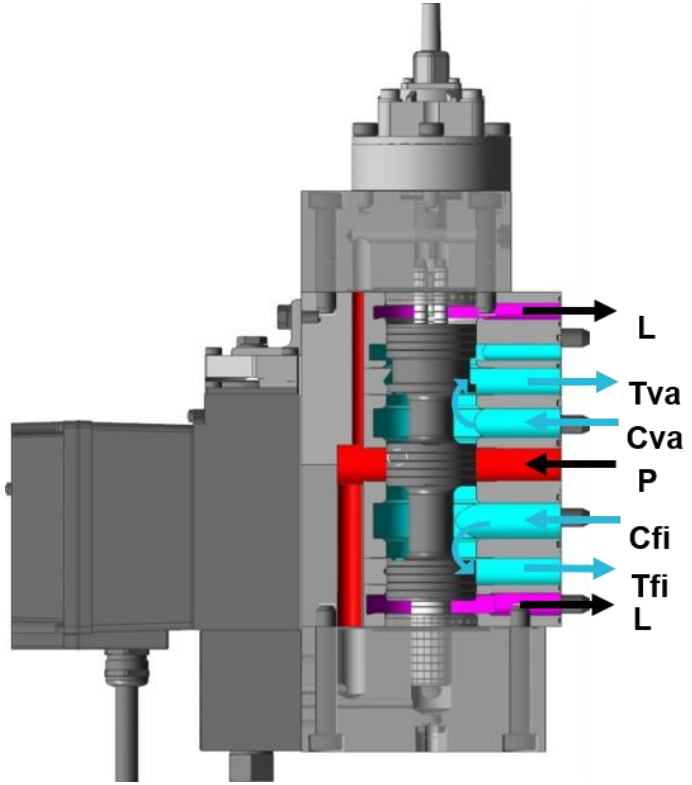


Components

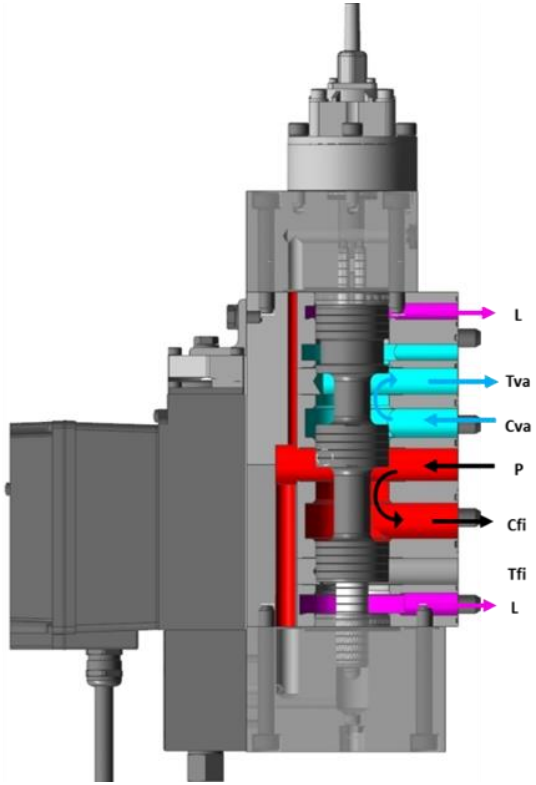
FIVA - Operation



Exhaust valve operation



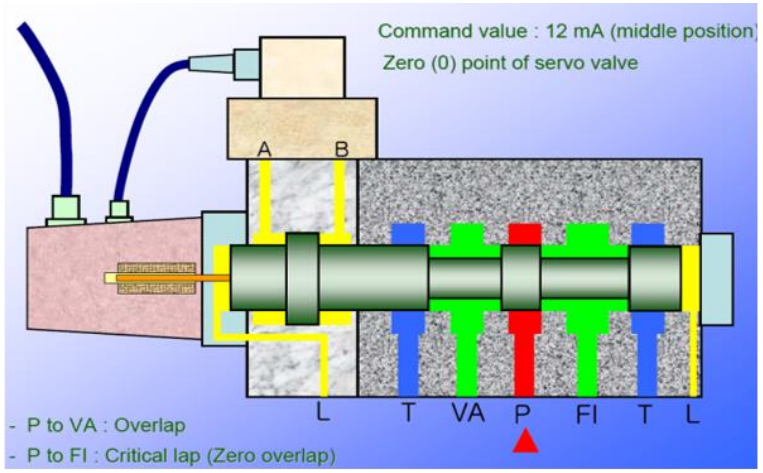
Neutral

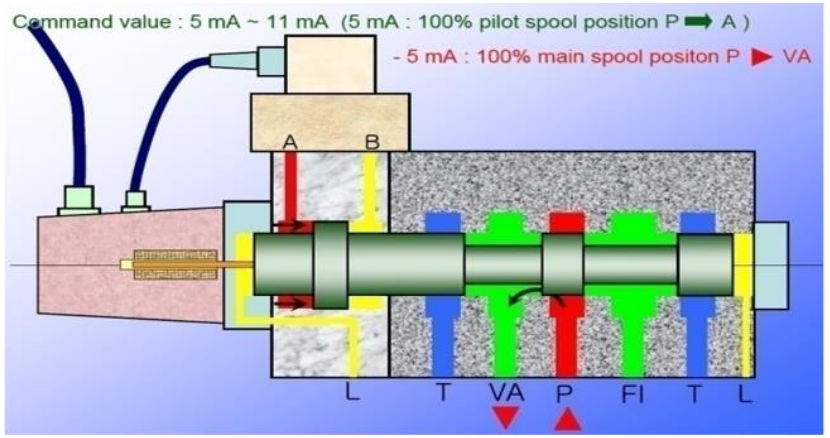


Fuel injection

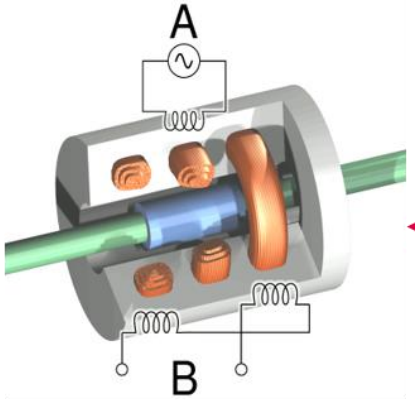
Components

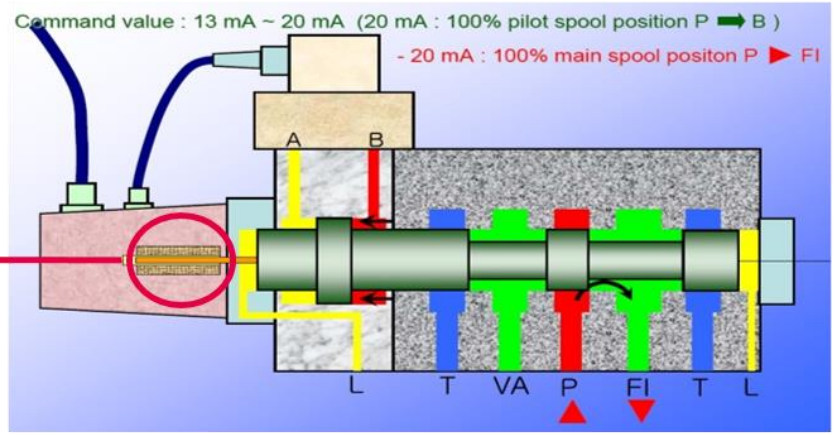
FIVA – Bosch Rexroth





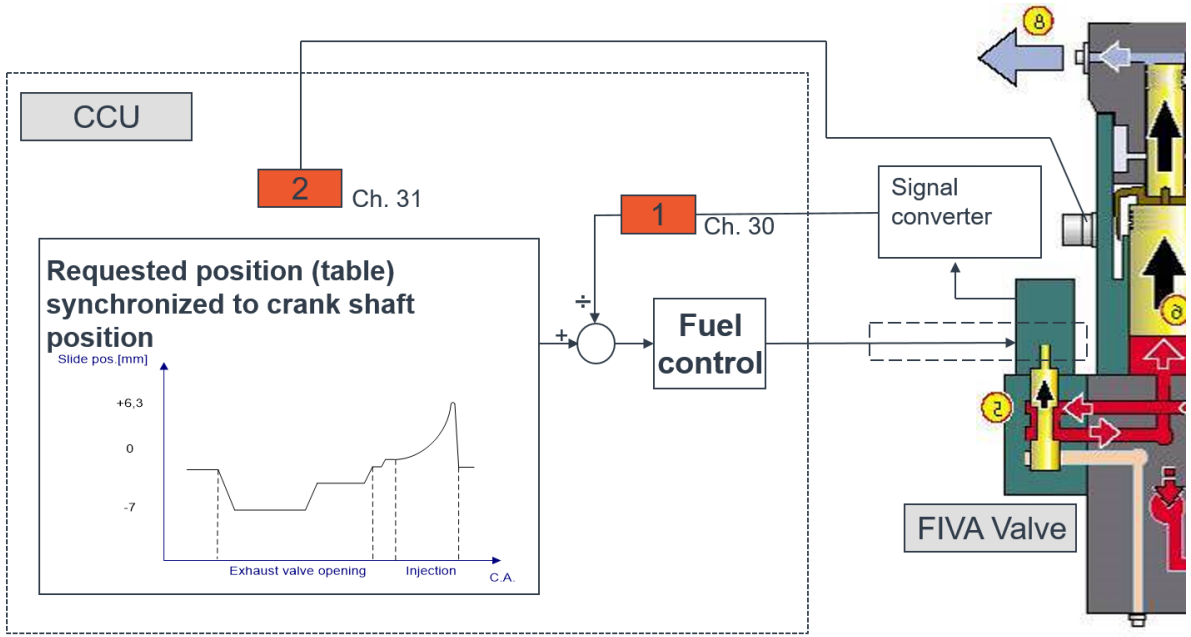
Main spool position
Feedback from LVDT sensor.
Linear variable differential transformer





Components

FIVA – Feedback signals



The FIVA is immediately set to exhaust valve open position: (Safe position) if:

1

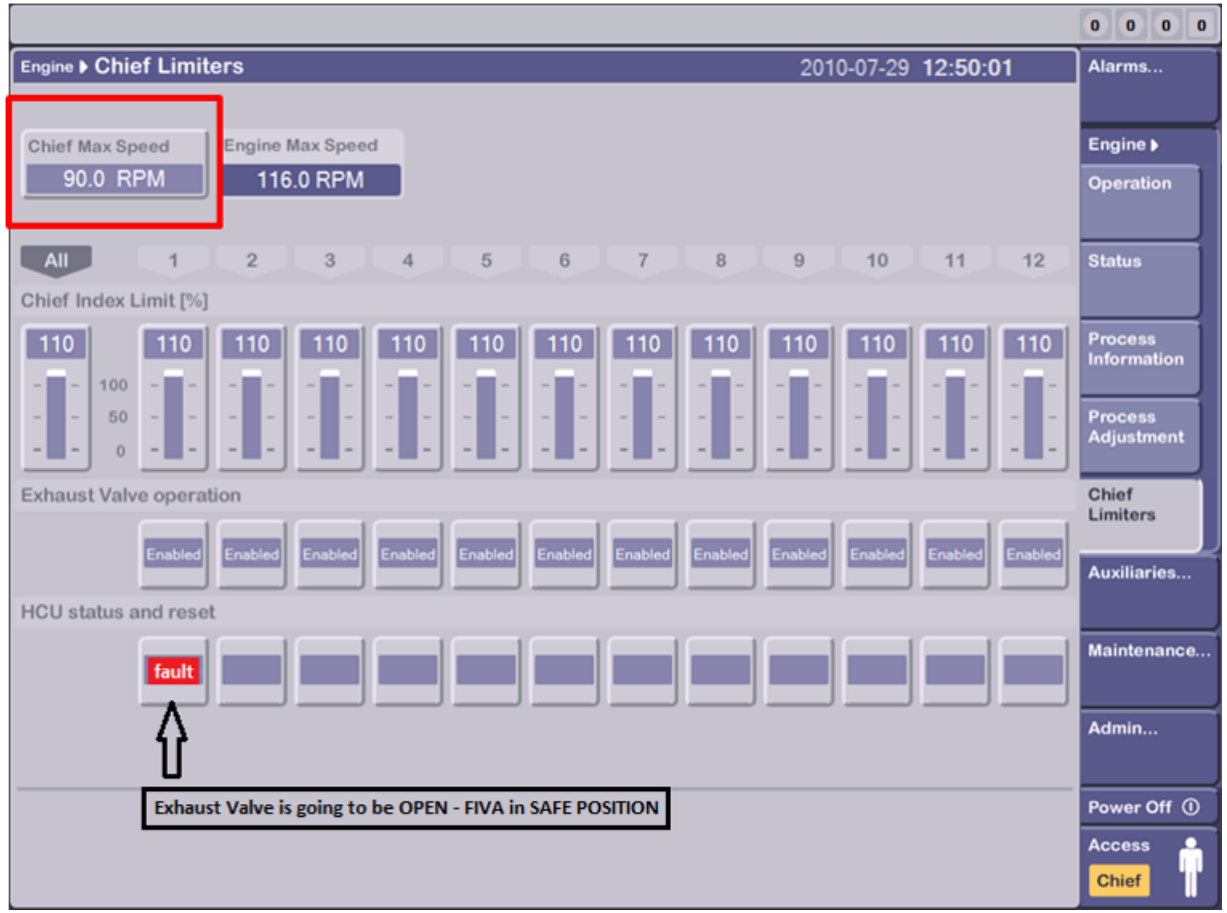
- The FIVA valve feed back signal is not valid, i.e. outside 4-20 mA
- The FIVA valve feed back signal indicates a too high (not physical possible) speed
- The FIVA valve feed back signal indicates a position not allowed outside a window around TDC

2

- The fuel booster position feed back signal indicates that the fuel booster is moving during the compression stroke.
  Reset by resetting CCU in question, or invalid / valid these 2 inputs Ch. 30 & 31

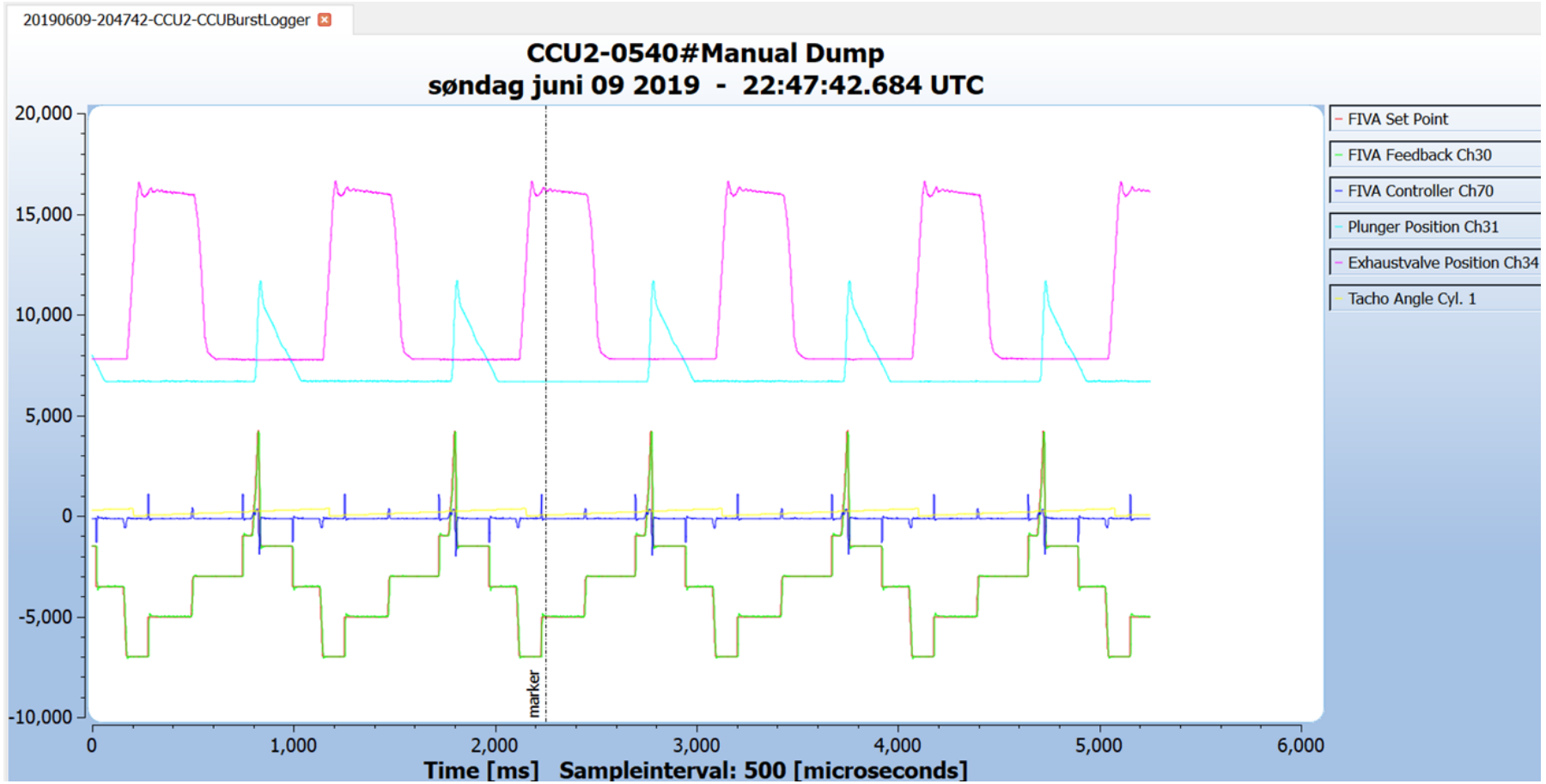
Components

FIVA – Safe position identified



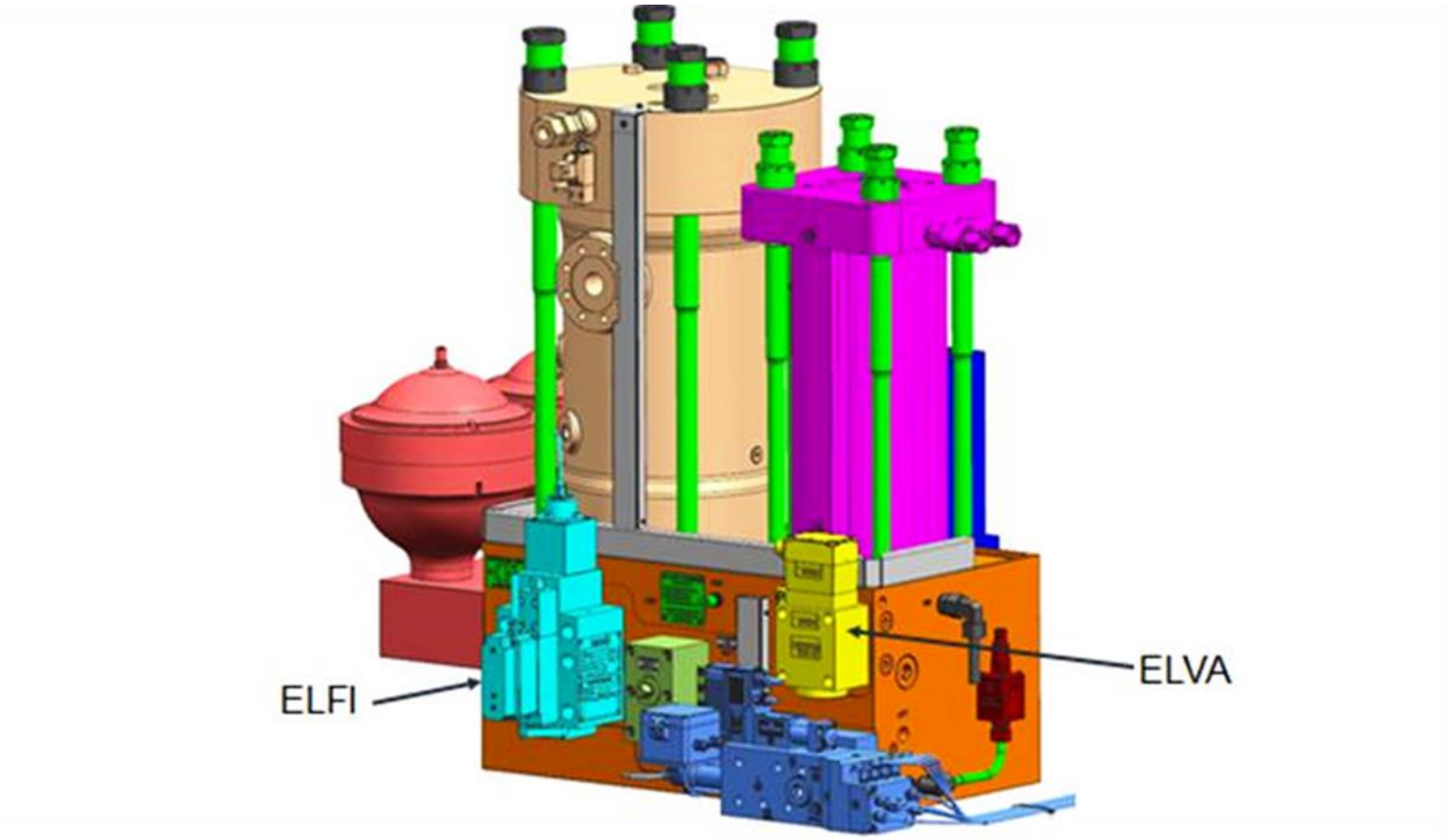
Components

FIVA – HCU events



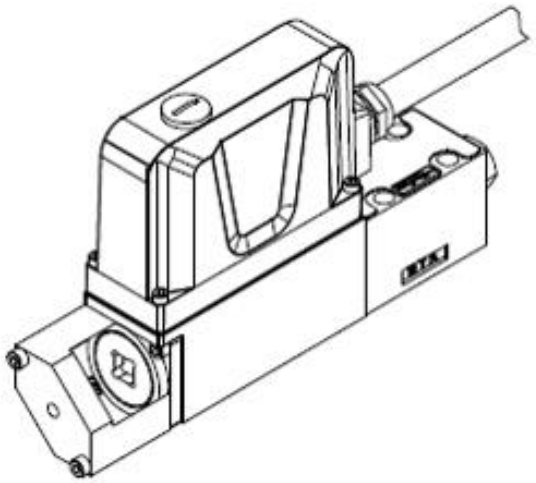
Components

FIVA – ELFI & ELVA

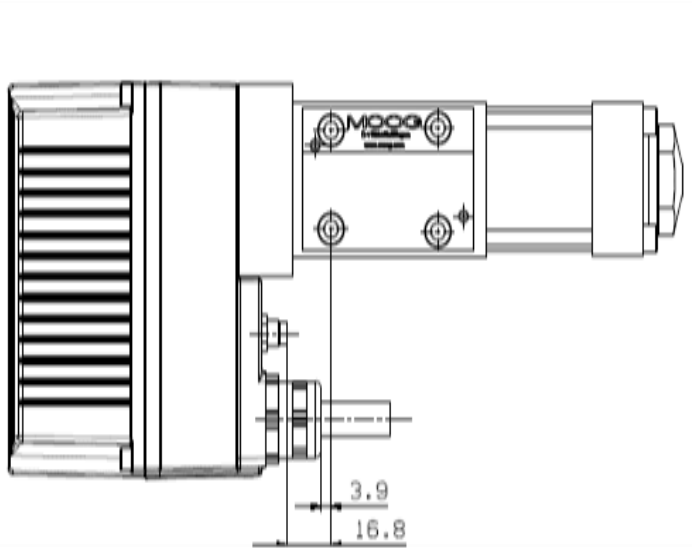


Components

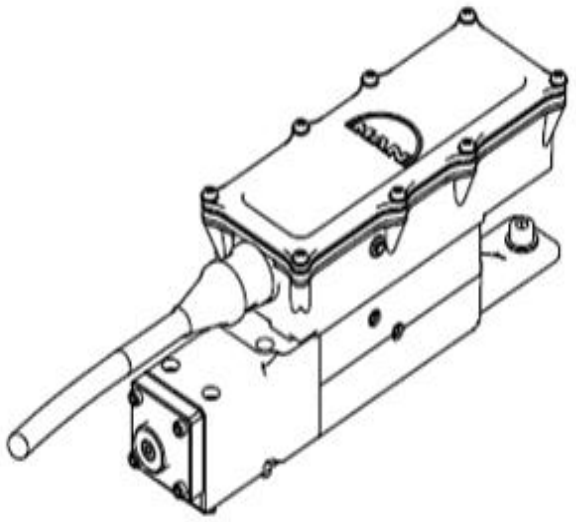
FIVA – Pilot valves



Parker



MOOG



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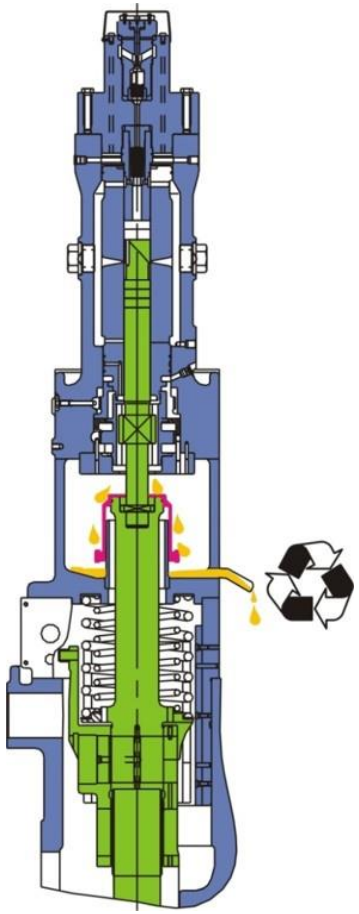
Agenda

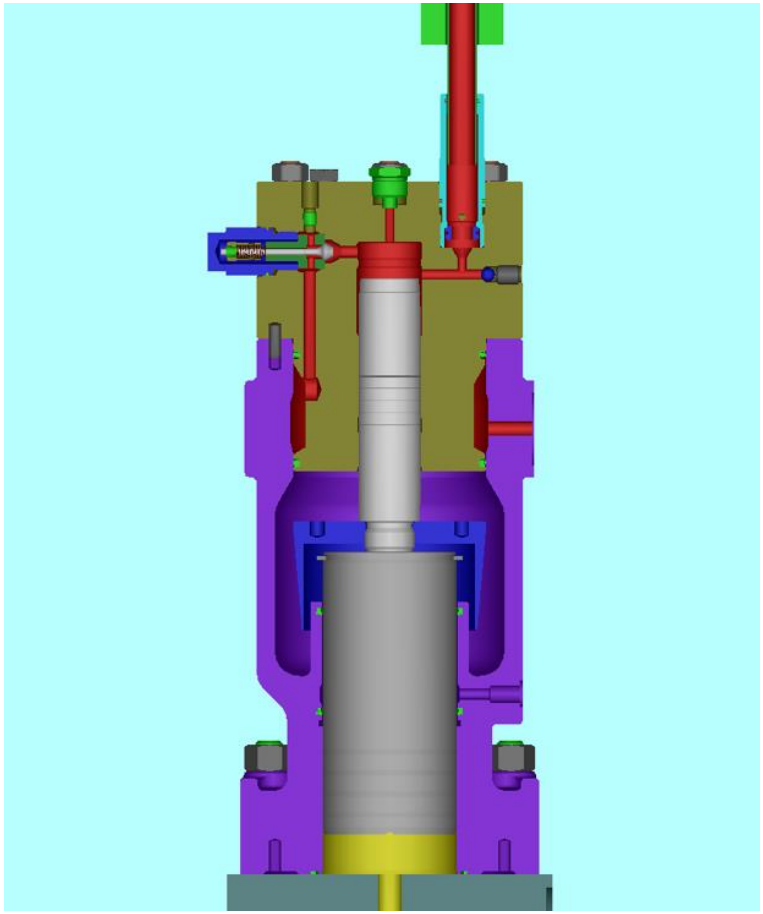
Components

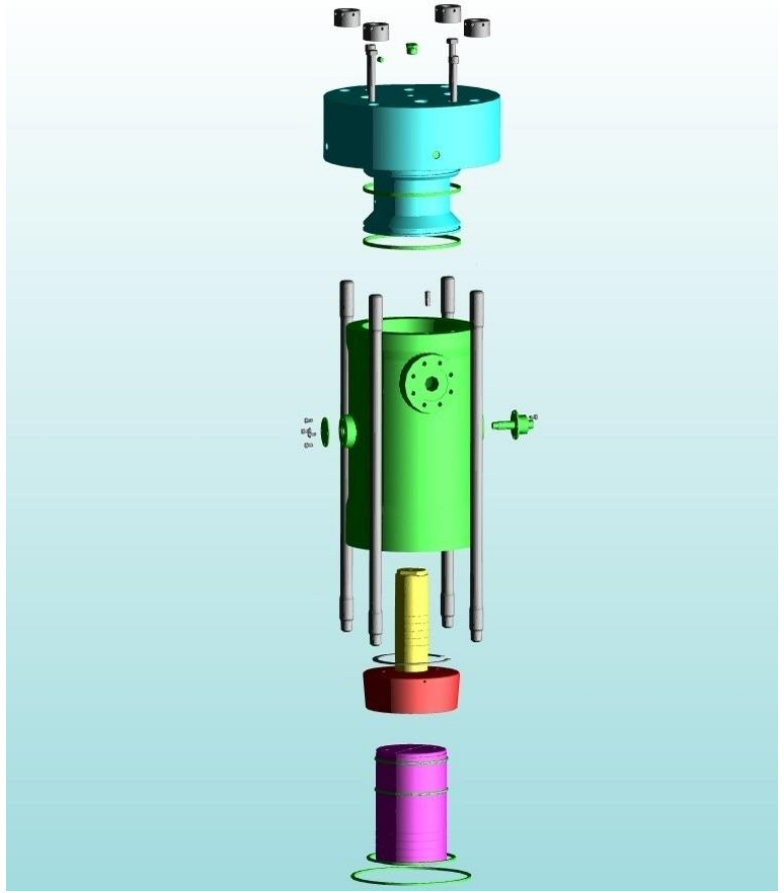
1. **FIVA**
2. **Fuel oil pressure booster**
3. **Exhaust valve**
   - Actuator
   - Designs

Components

MC fuel pump to ME fuel oil pressure booster

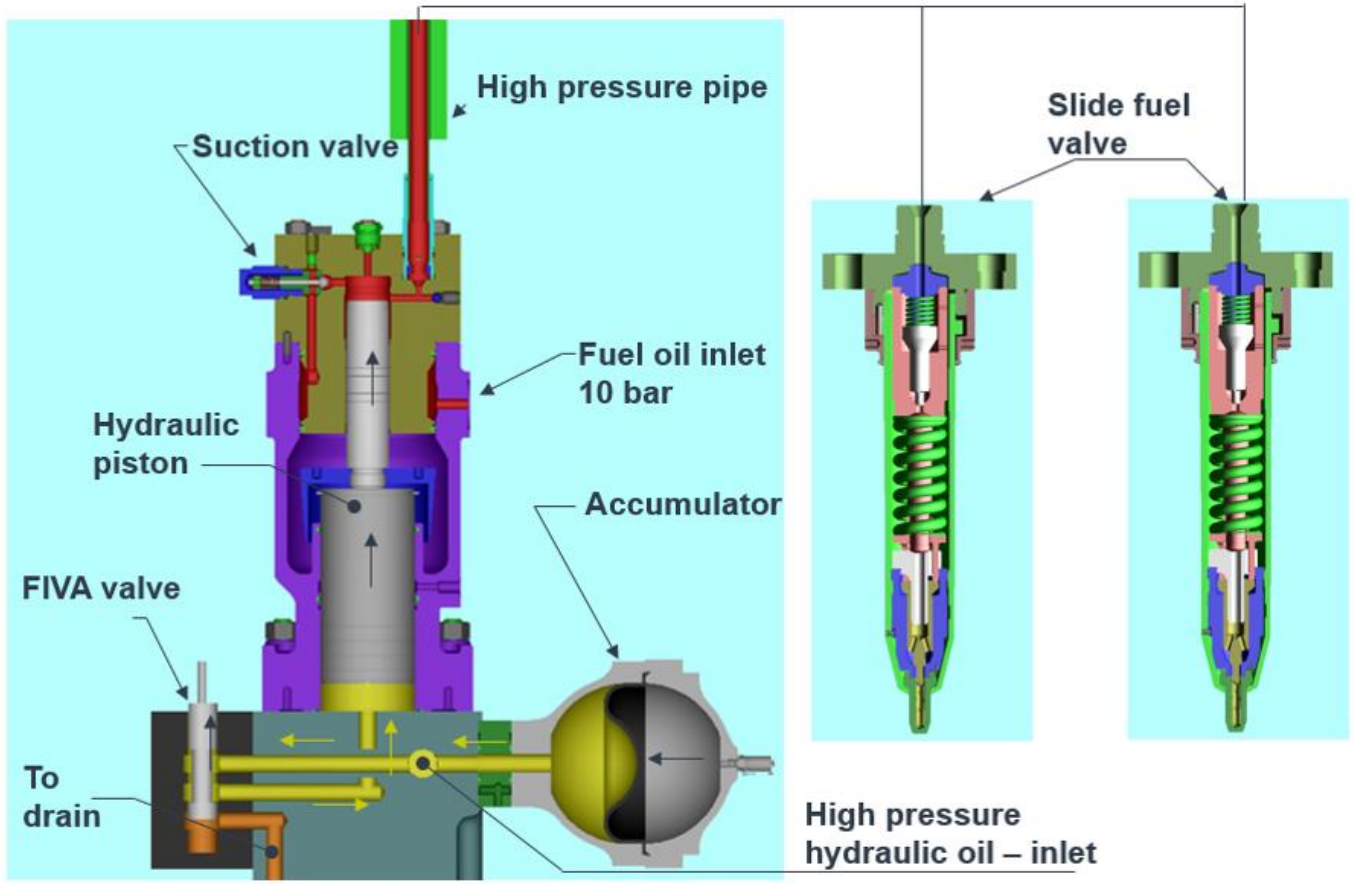






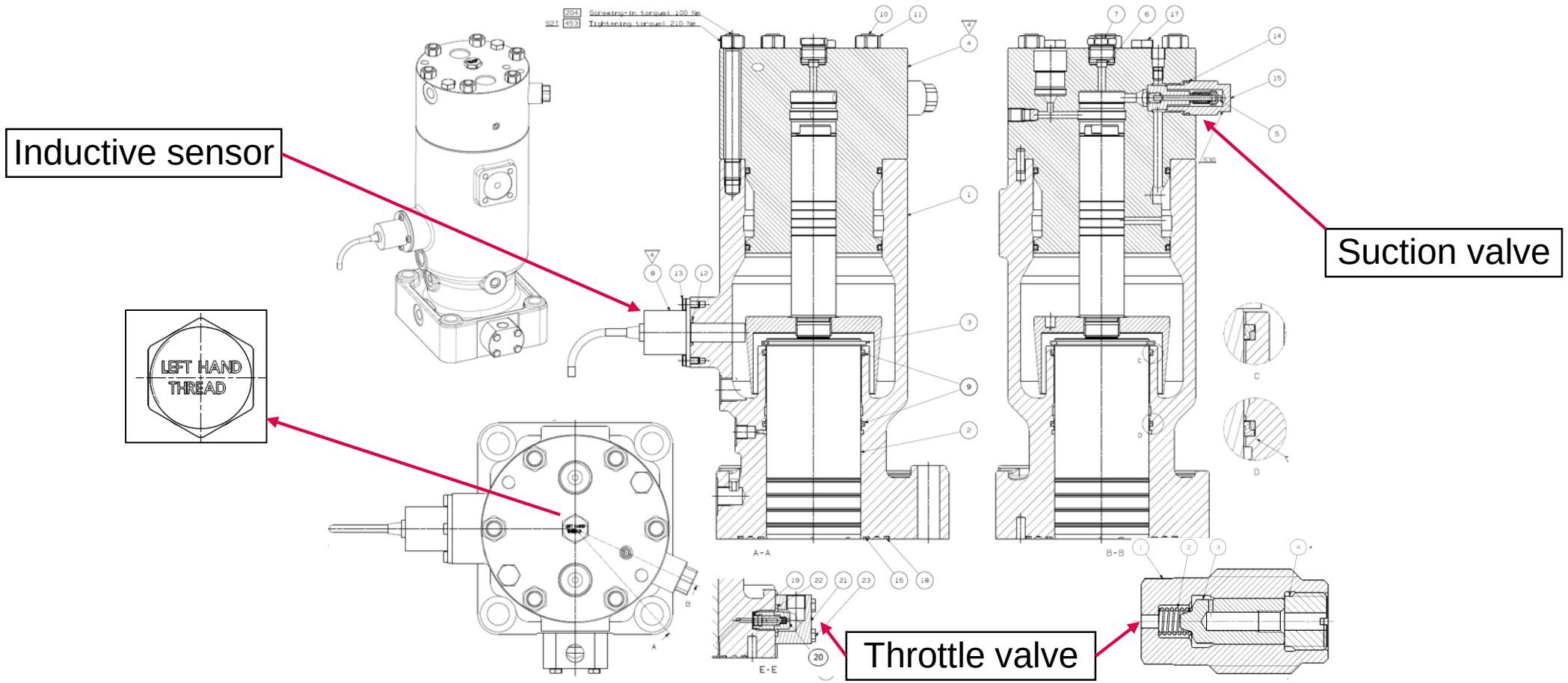
Components

Principle



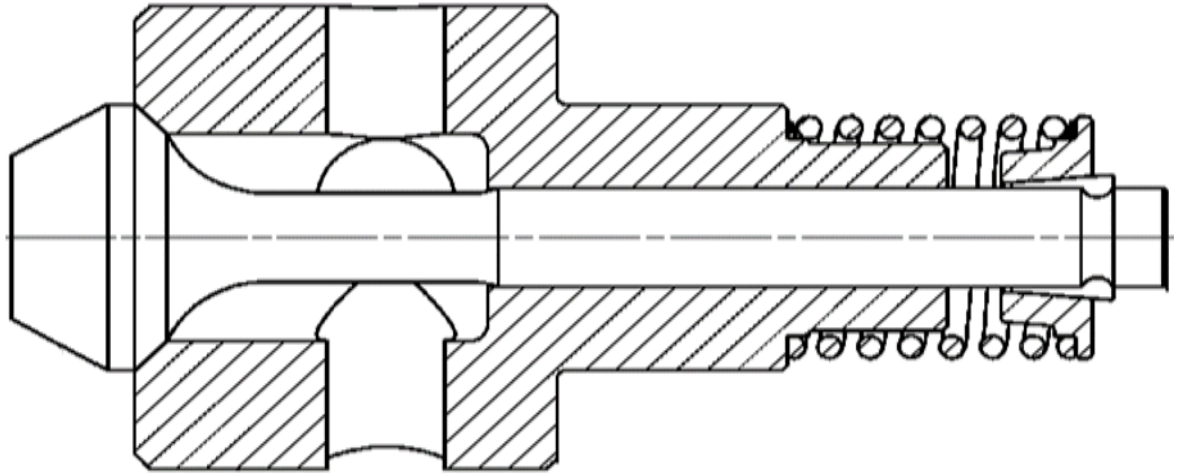
Components

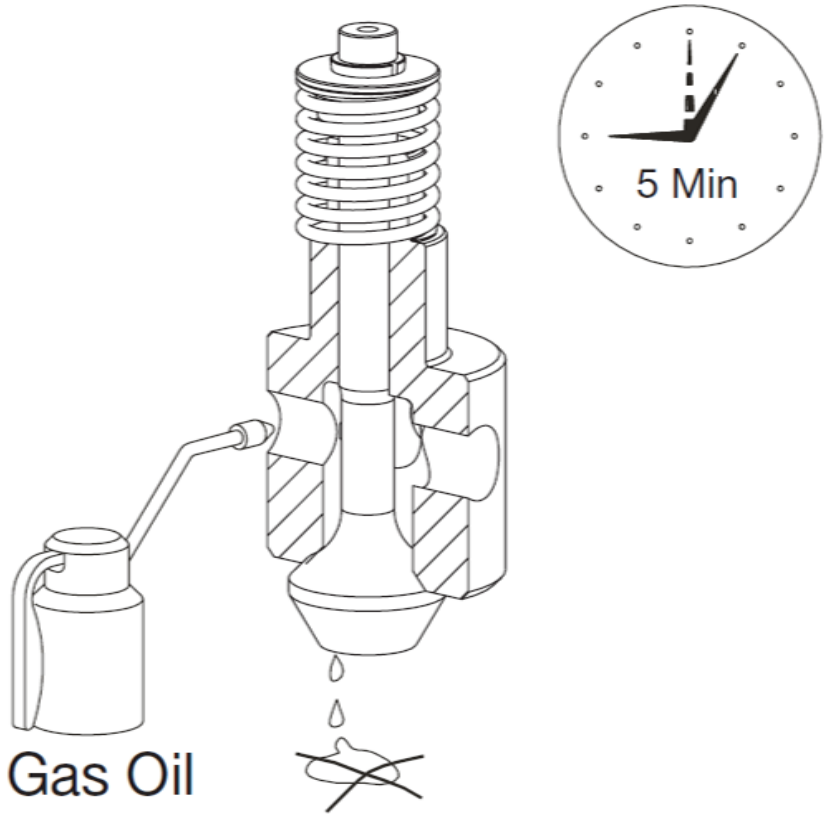
Cross section



Components

Suction valve





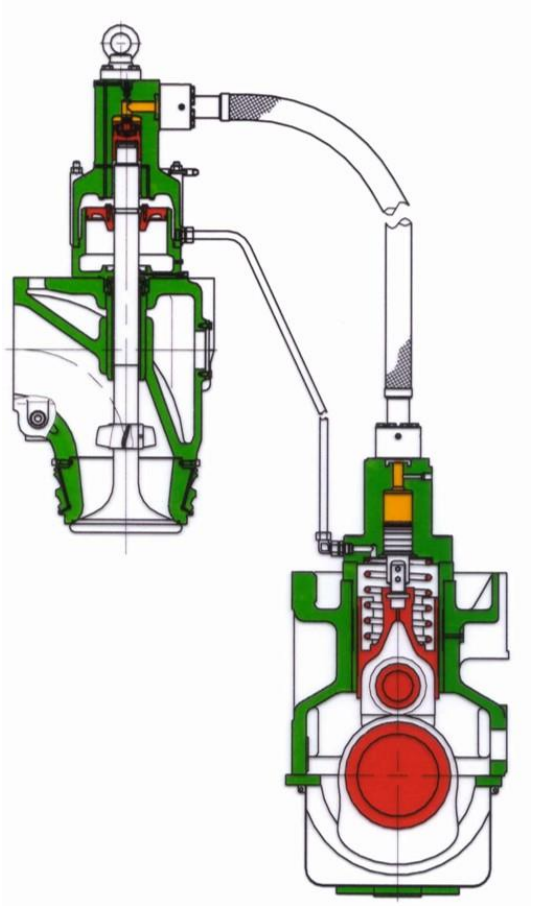
Agenda

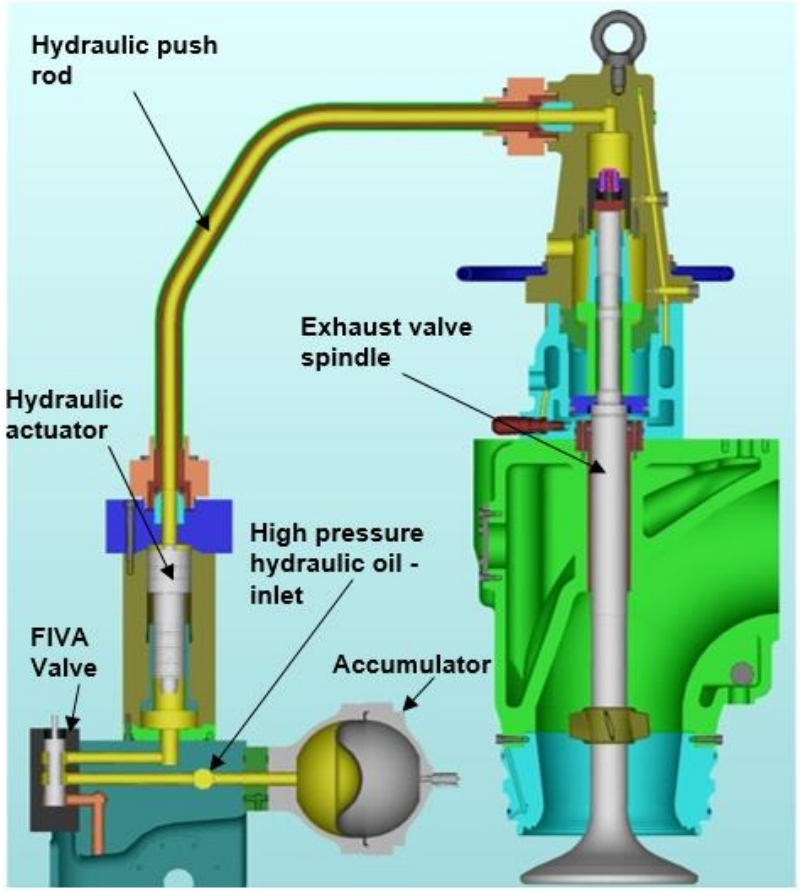
Components

1. **FIVA**
2. **Fuel oil pressure booster**
3. **Exhaust valve**
   - Actuator
   - Designs

Components

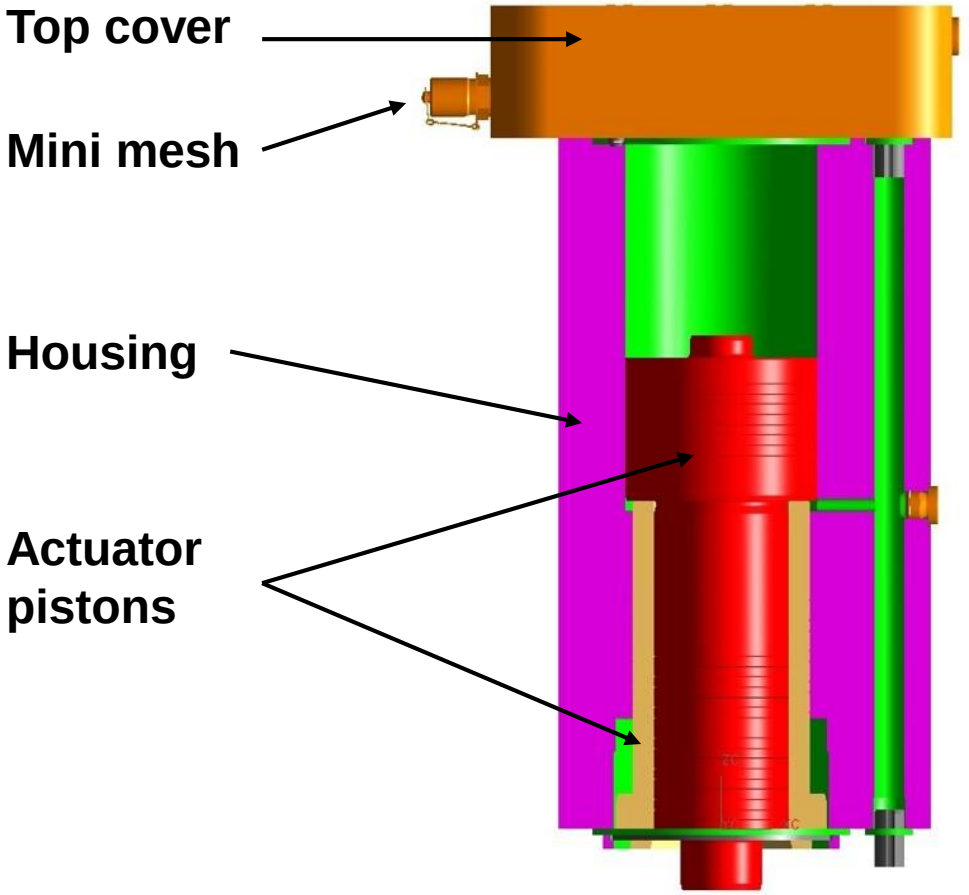
MC to ME





Components

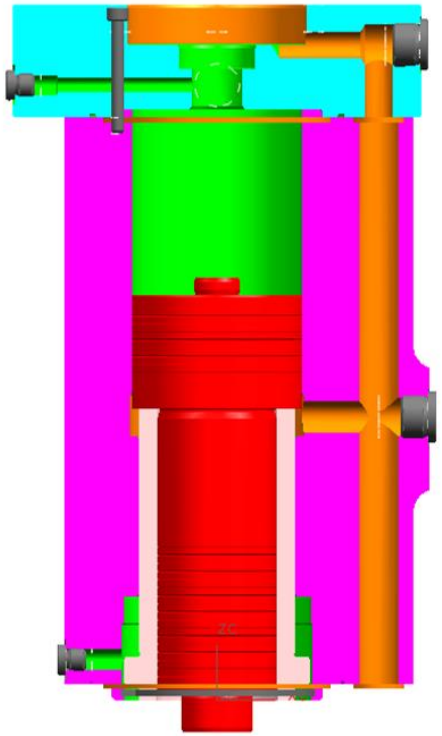
Components



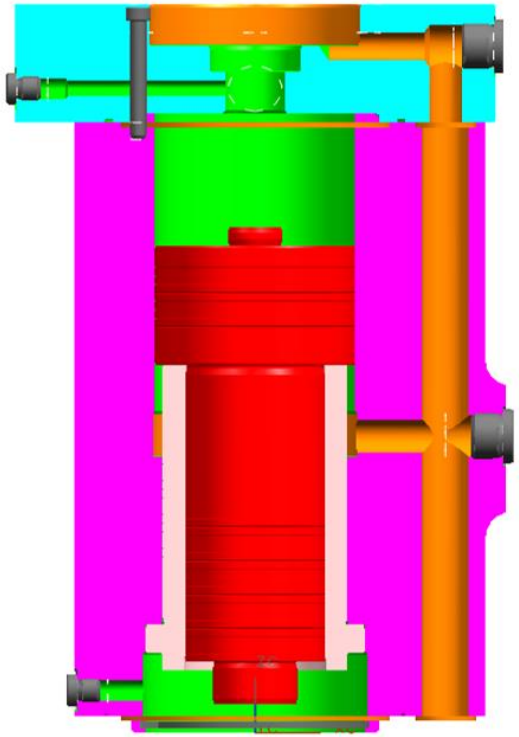
Components

Actuators

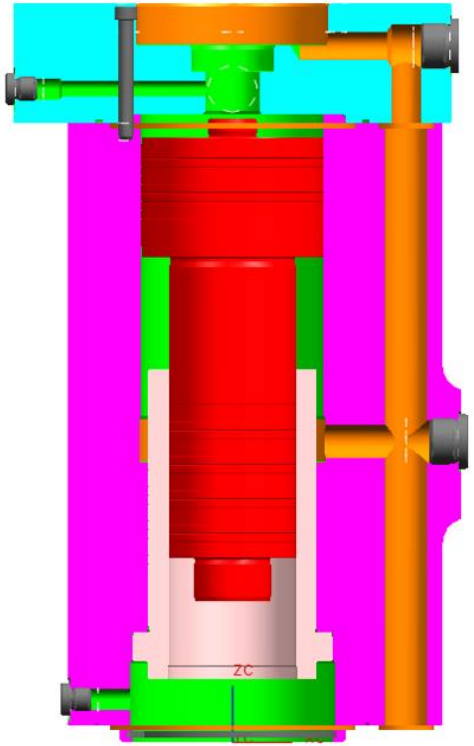
Initial position



Step 1



Step 2



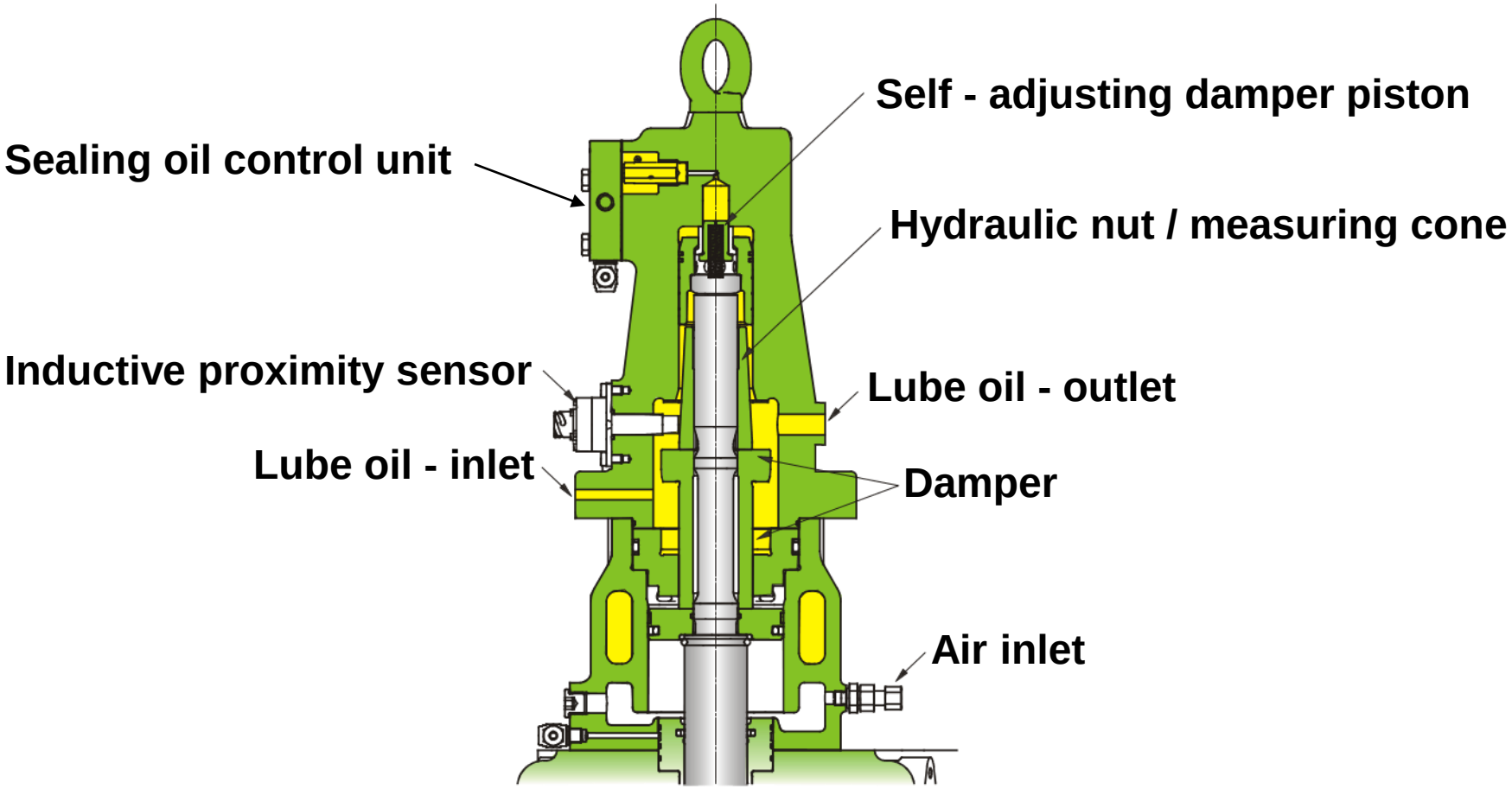
Agenda

Components

1. **FIVA**
2. **Fuel oil pressure booster**
3. **Exhaust valve**
   - Actuator
   - Designs

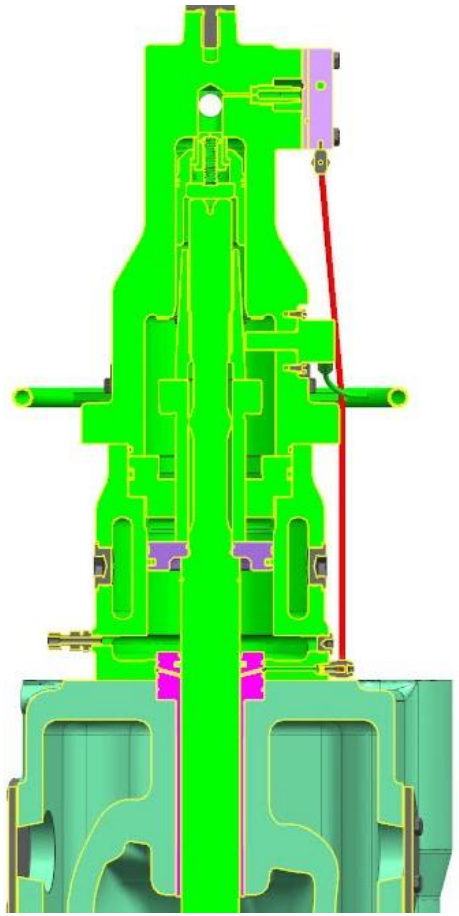
Components

High force exhaust valve



Components

High force exhaust valve – Sealing oil control unit



Sealing oil control unit

Applied to all high force valves

Lubrication of spindle stem

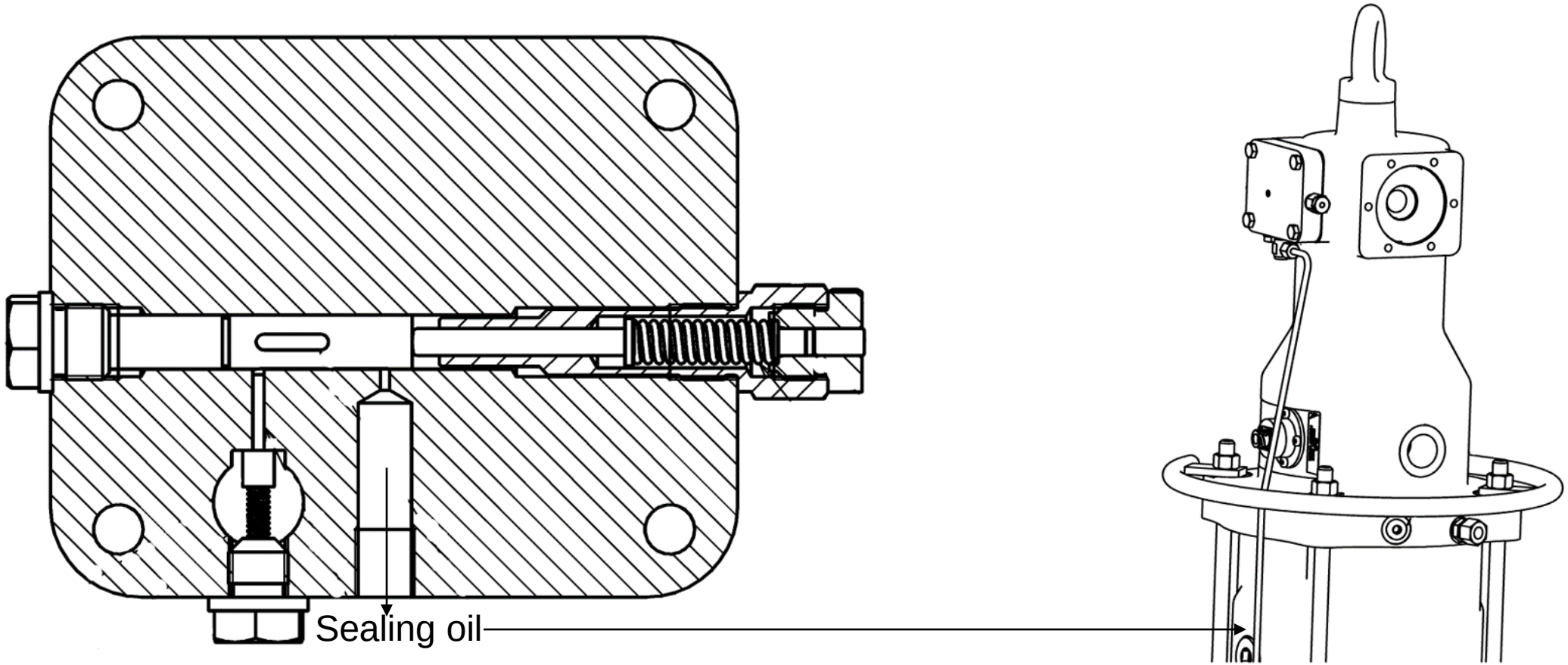
Consumption one liter / day per cylinder

Complex design

Indicator pin for activation

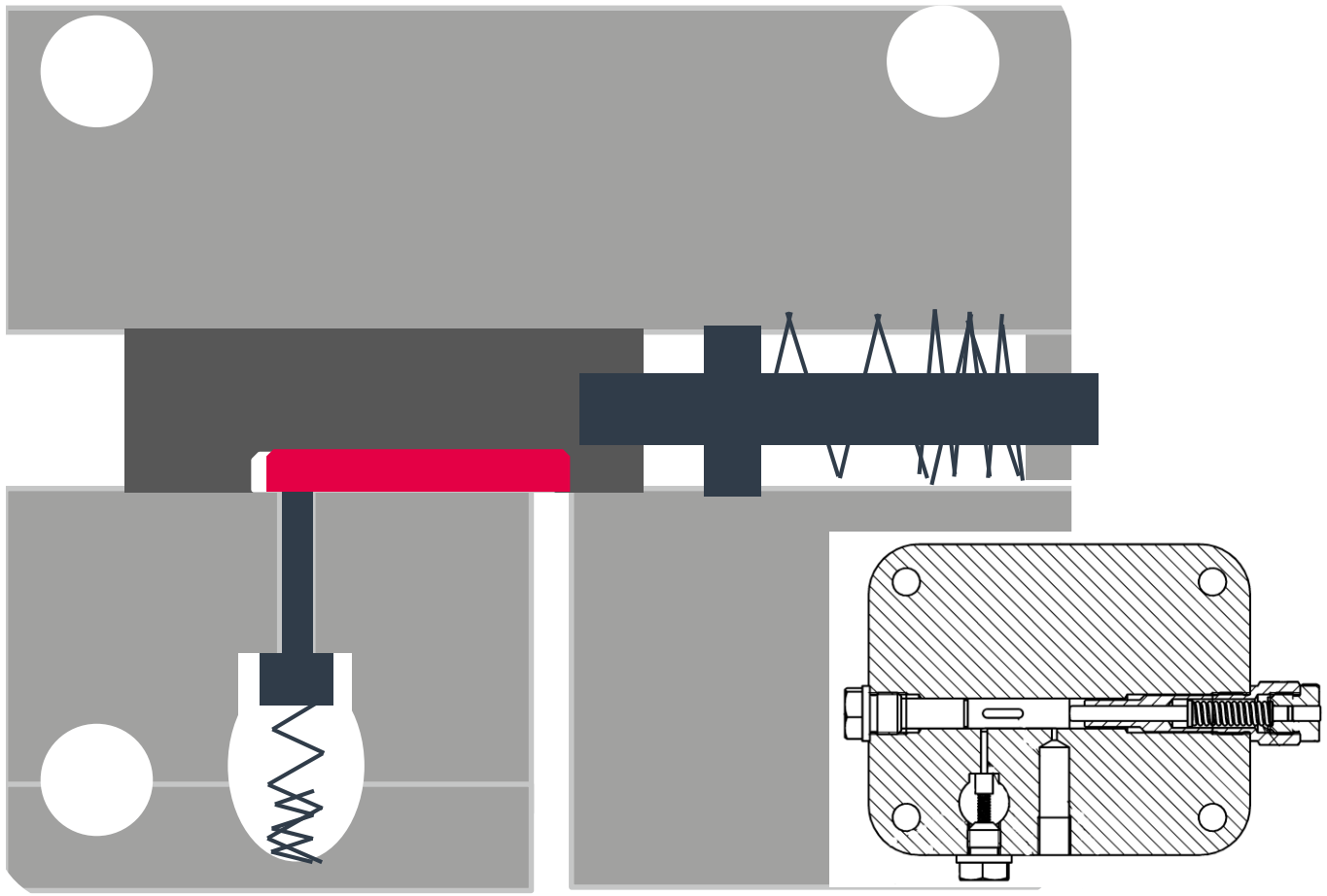
Components

High force exhaust valve – Sealing oil control unit

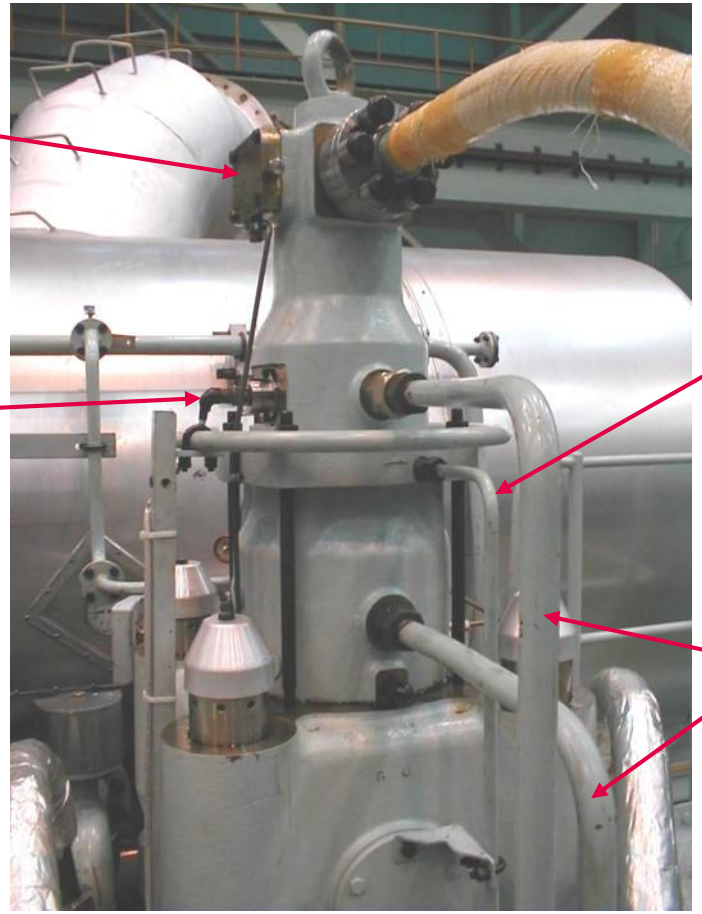


Components

High force exhaust valve – Sealing oil control unit



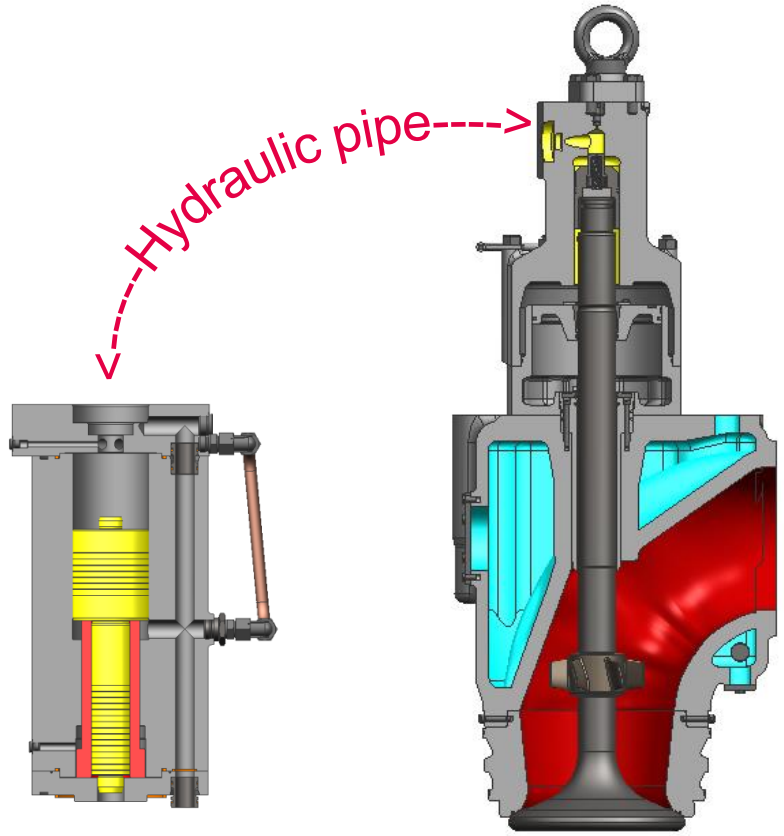
Components


Sealing oil control unit
Feedback sensor
Damper oil - inlet
Drain pipes

Components

Low force exhaust valve

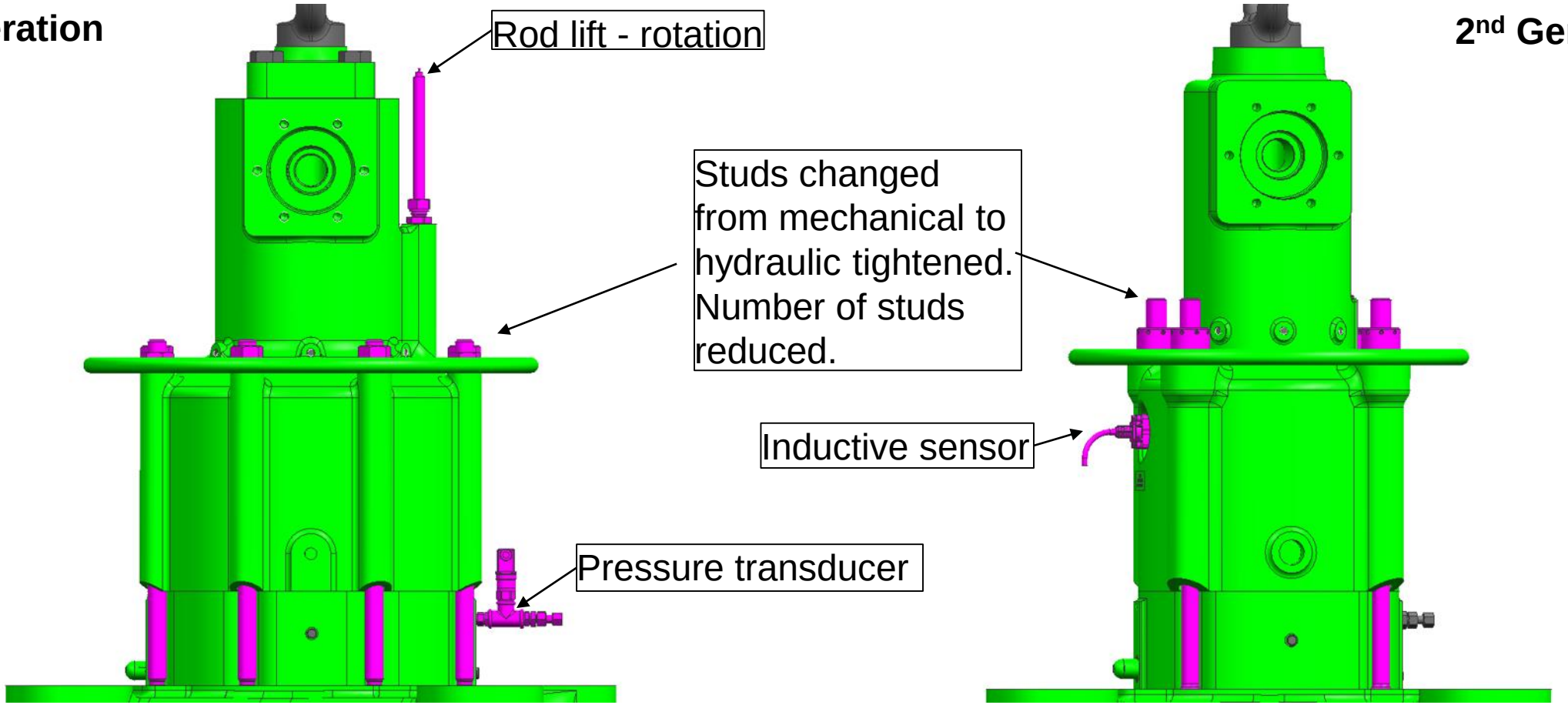
– Cost reduction
– Less force and cavitation in hydraulic pipe and actuator
– Dura spindle design applied
– Longer Time Between Overhaul (TBO)
– Controlled Oil Level (COL)
– In some cases down sizing of HPS can also be possible
– Step one stroke and step two diameter reduced in actuator



Components

1st and 2nd generation

1st Generation



2nd Generation

Components

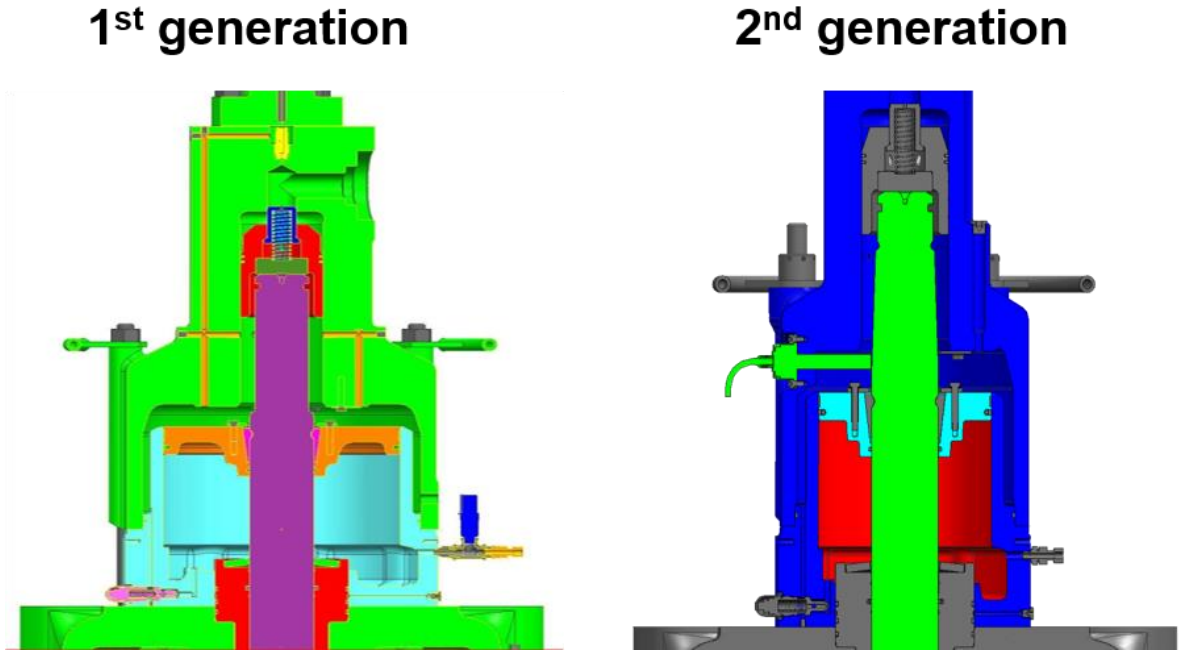
1st and 2nd generation

Reduced diameter on oil cylinder, air cylinder and air piston (reducing weight)

Added cone on exhaust valve spindle (for direct measurement of valve stroke)

Added inductive sensor for direct measurement of valve stroke

Simplifying air spring by increasing air pressure from three bar to seven bar (removing reduction station)



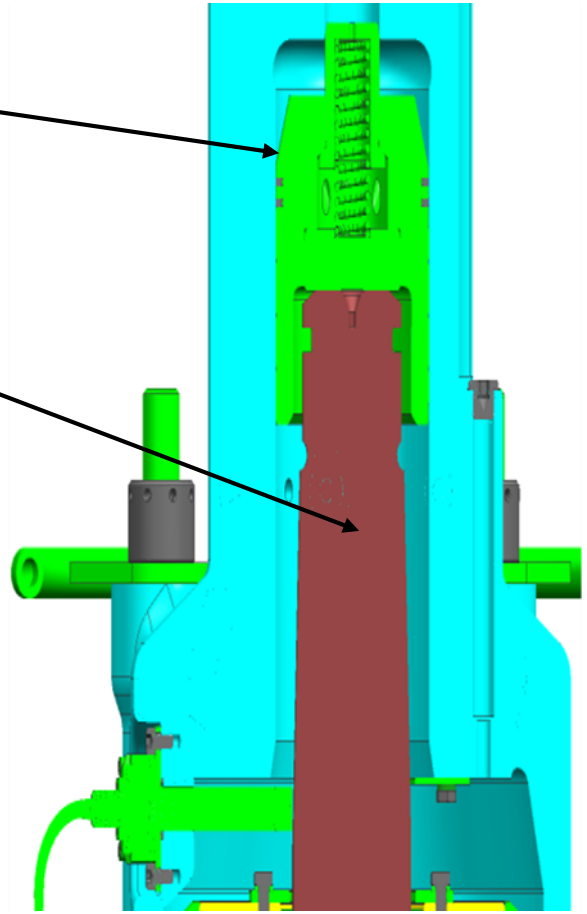
Components

2nd generation low force

Shorter piston, actuator

Cone on exhaust valve spindle

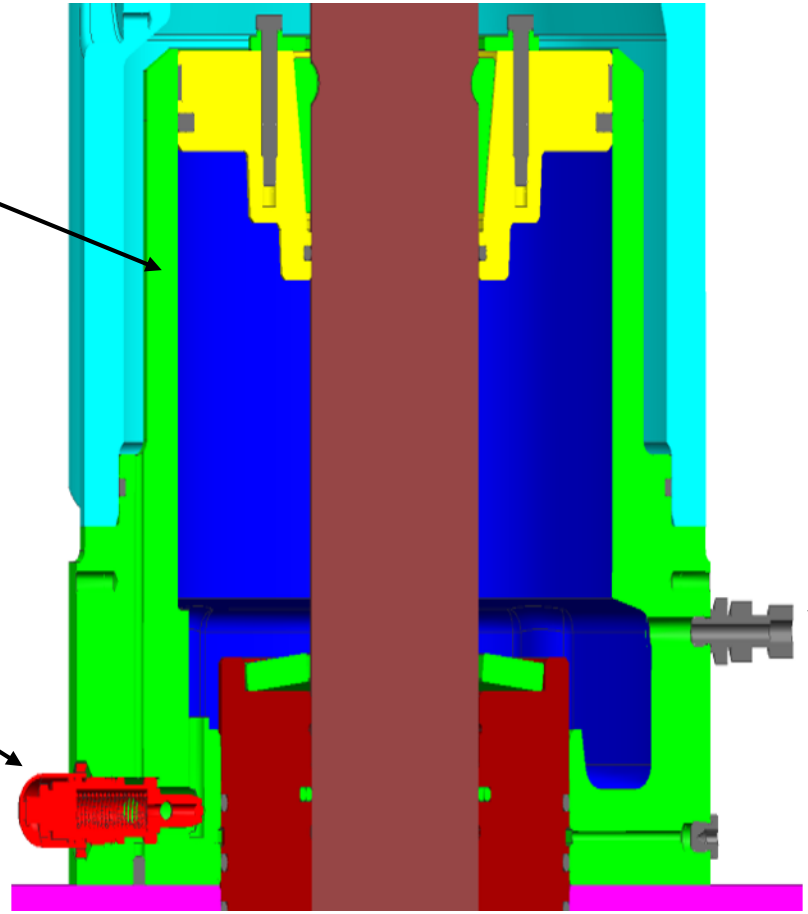
Inductive sensor for feedback



Components

2nd generation low force

Diameter of air spring reduced, which means volume and weight reduced.

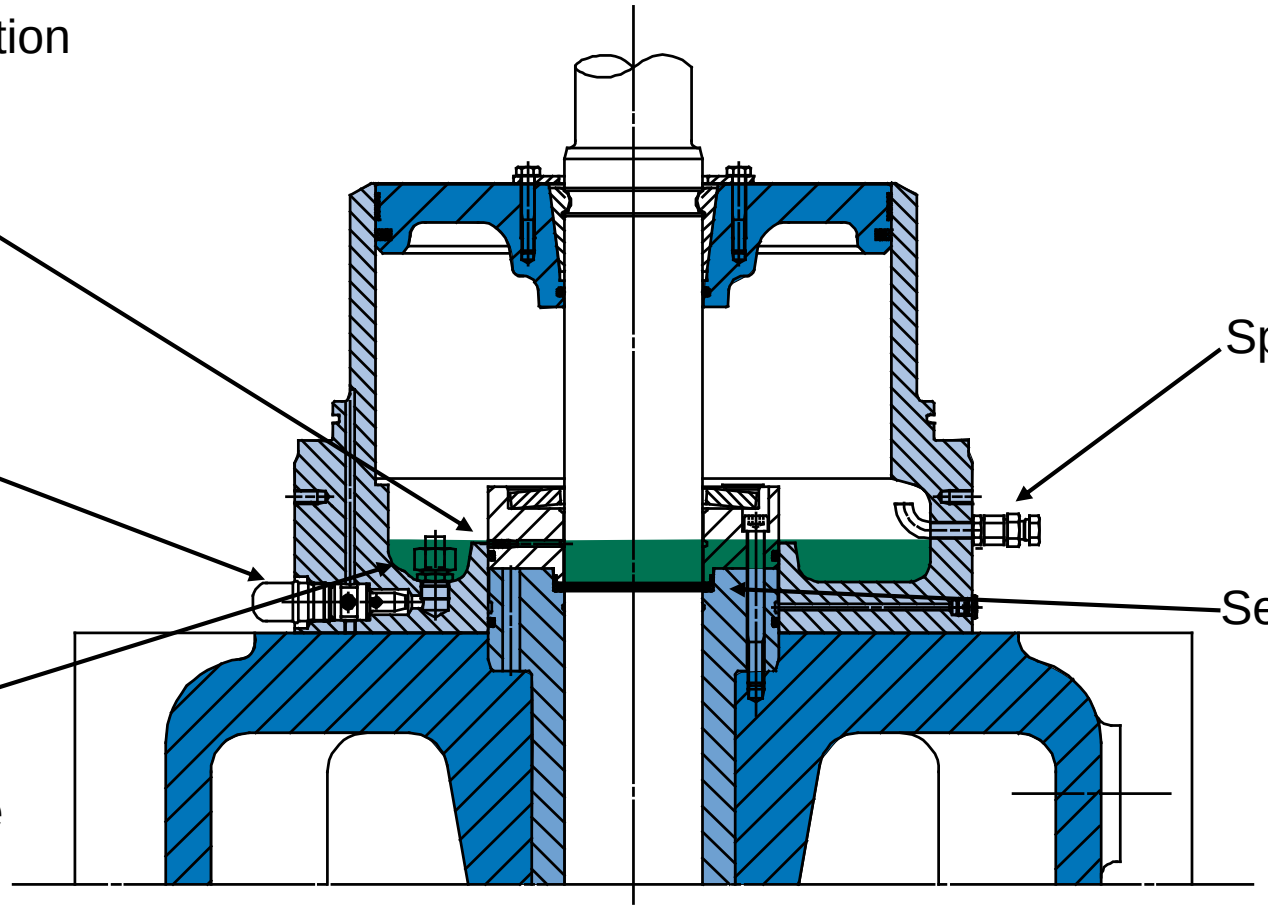


Safety valve

Air inlet pressure increased to seven bars

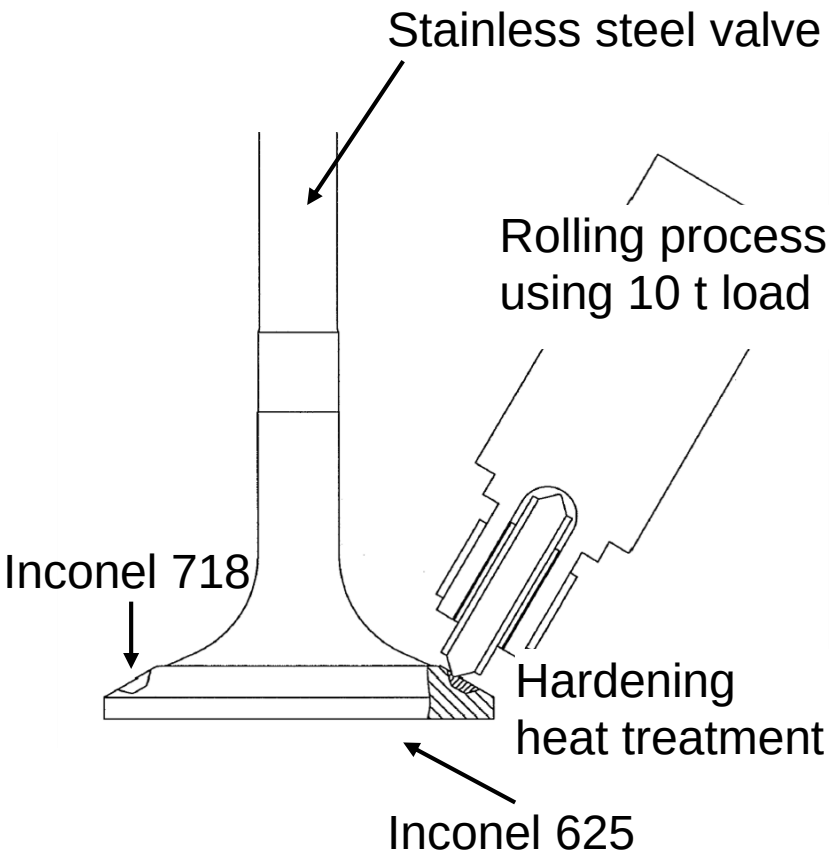
Components

Controlled Oil Level (COL)



Components

DURA spindle



Components

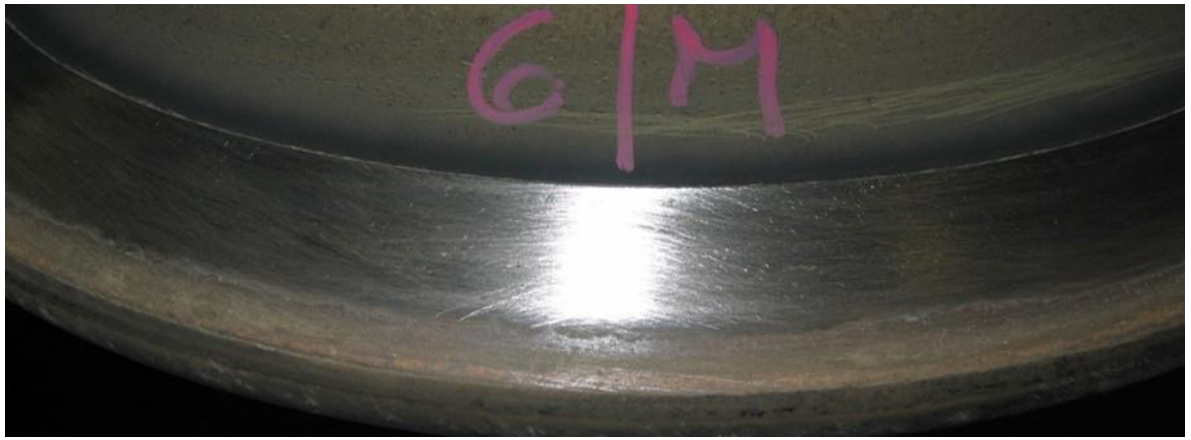
DURA spindle – in service

Nimonic spindle & W - seat

S60MC, 25.500 running hours

DURA spindle & W - seat

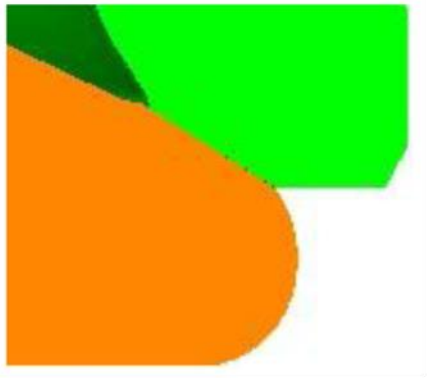
S60MC, 34.000 running hours



Components

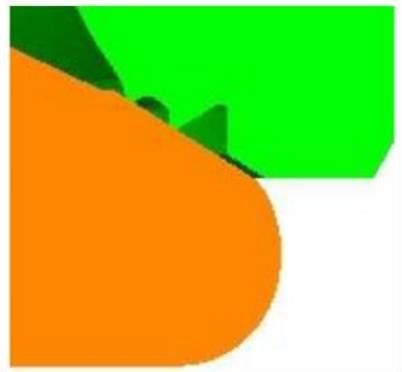
Seat geometry and development

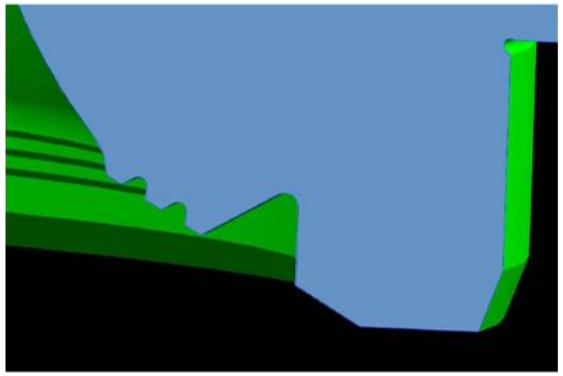
1983 – Wide Seat



1985 – Chamber seat

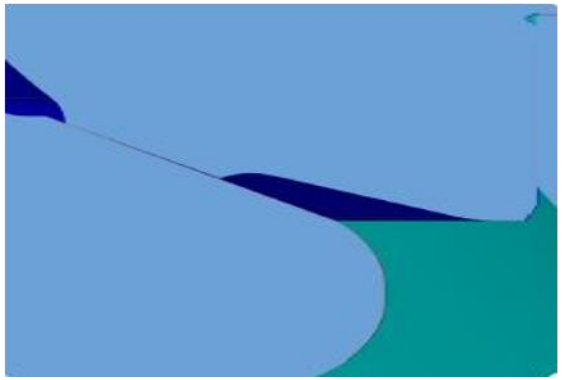
2001- W-Seat





2013 – triple V

2014 – Wide seat



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