MAN Energy Solutions
Future in the making

Hydraulic Cylinder Unit

(HCU)

PrimeServ Academy Copenhagen

MAN PrimeServ

Company policy

Please do not record the training session.

We appreciate your understanding!

Learning objectives

Upon completion of this module you …

– will be able to recognize the working principle of the hydraulic cylinder unit

– will be able to identify the individual components in the system

– will be able to apply correct lubrication according to latest service letter

Agenda

Hydraulic Cylinder Unit (HCU)

1 **High pressure pipes**

2 **Distribution block**

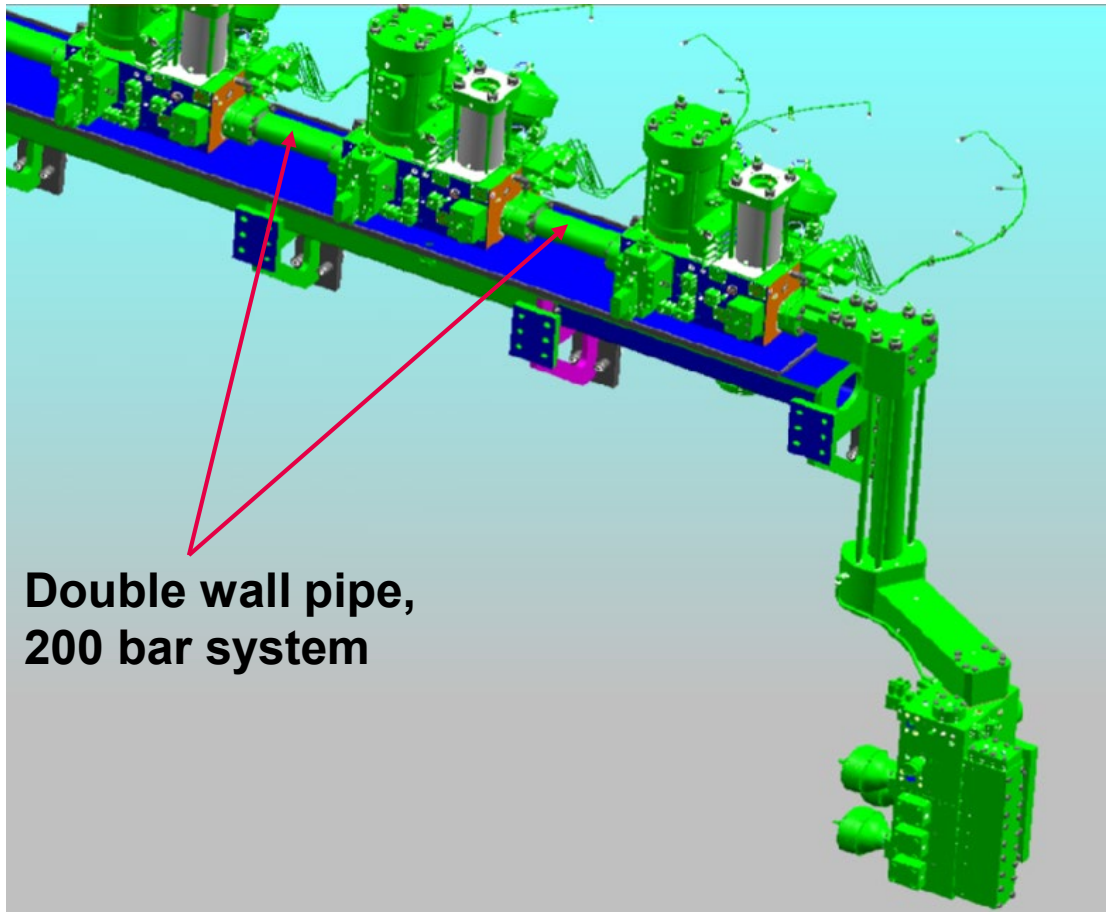
3 **Components:**

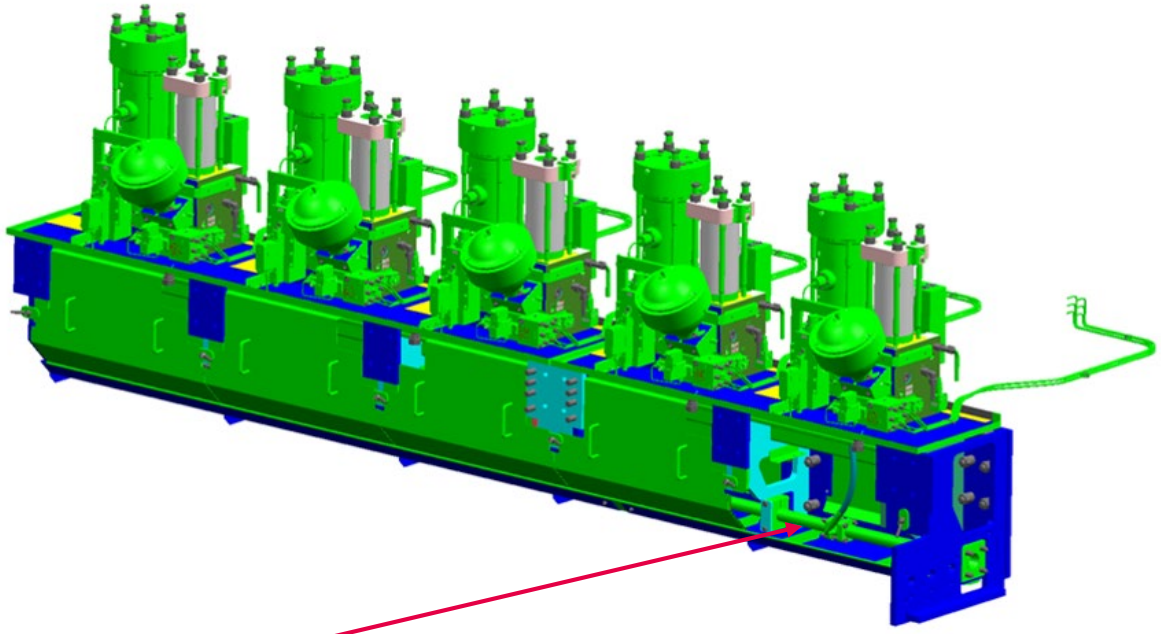
- Accumulators
- Lubricator

4 **Lubrication (SL2019 - 671)**

Hydraulic Cylinder Unit (HCU)

High pressure pipes – 200 or 300 bars system





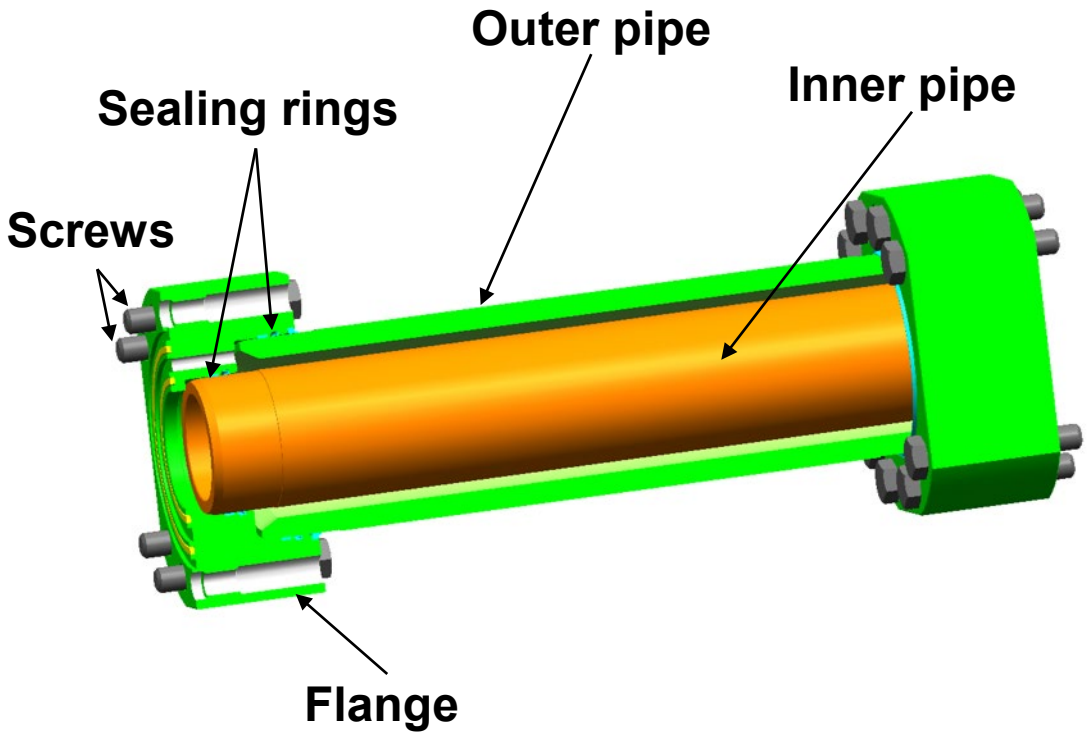
Single pipe in casing
300 bar system

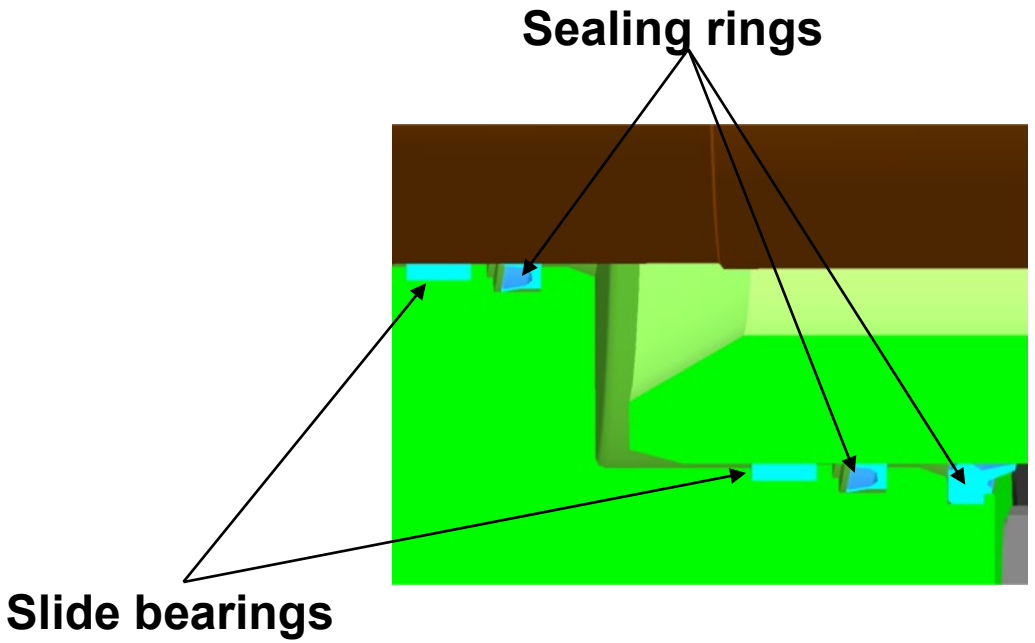
Hydraulic Cylinder Unit (HCU)

High pressure pipes – 200 or 300 bars system

Hydraulic Cylinder Unit (HCU)

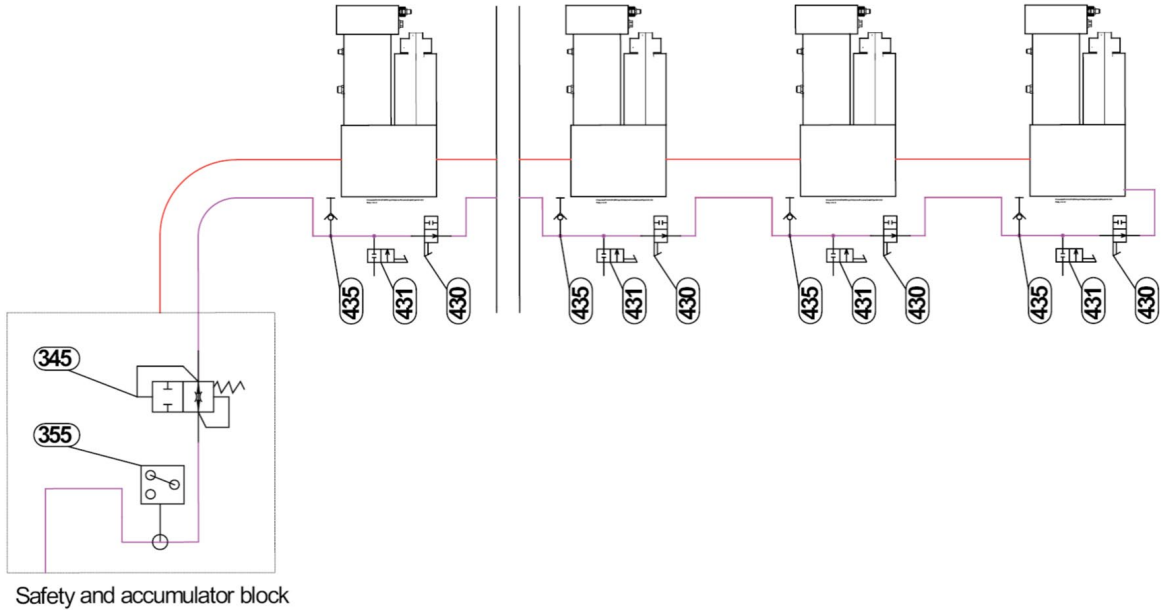
High pressure pipes – Double wall pipe (200 bar)





Hydraulic Cylinder Unit (HCU)

High pressure pipes – Leak detection 200 bars system



Safety and accumulator block

1. CLOSE the valve 430 at the last, but one Hydraulic Cylinder Unit (HCU).
2. OPEN the valve 431 at the last HCU to decrease the pressure in the space between the inner and outer pipe.
3. CLOSE the valve 431 at the last HCU again.
4. Check the pressure increase in the space between at position 435, at the last HCU.
5. If the pressure increases to system pressure level, the leakage has been found.
6. When the leakage has been eliminated, bring all the valves to their normal position.

Agenda

Hydraulic Cylinder Unit (HCU)

1 **High pressure pipes**

2 **Distribution block**

3 **Components:**

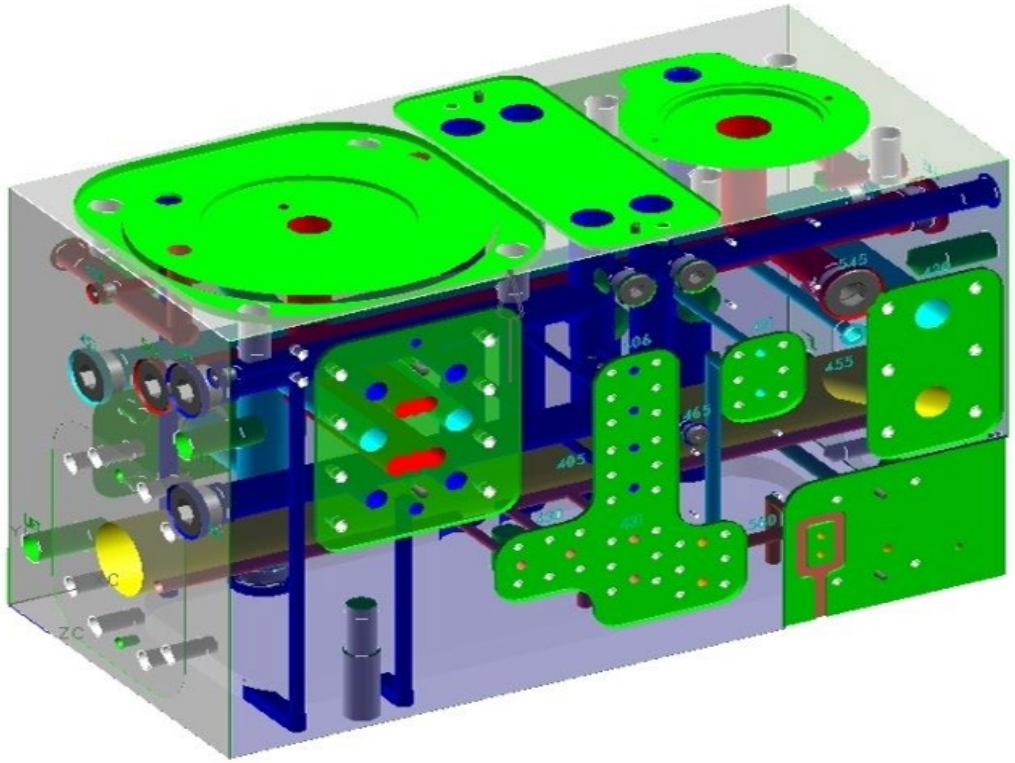
- Accumulators
- Lubricator

4 **Lubrication (SL2019 - 671)**

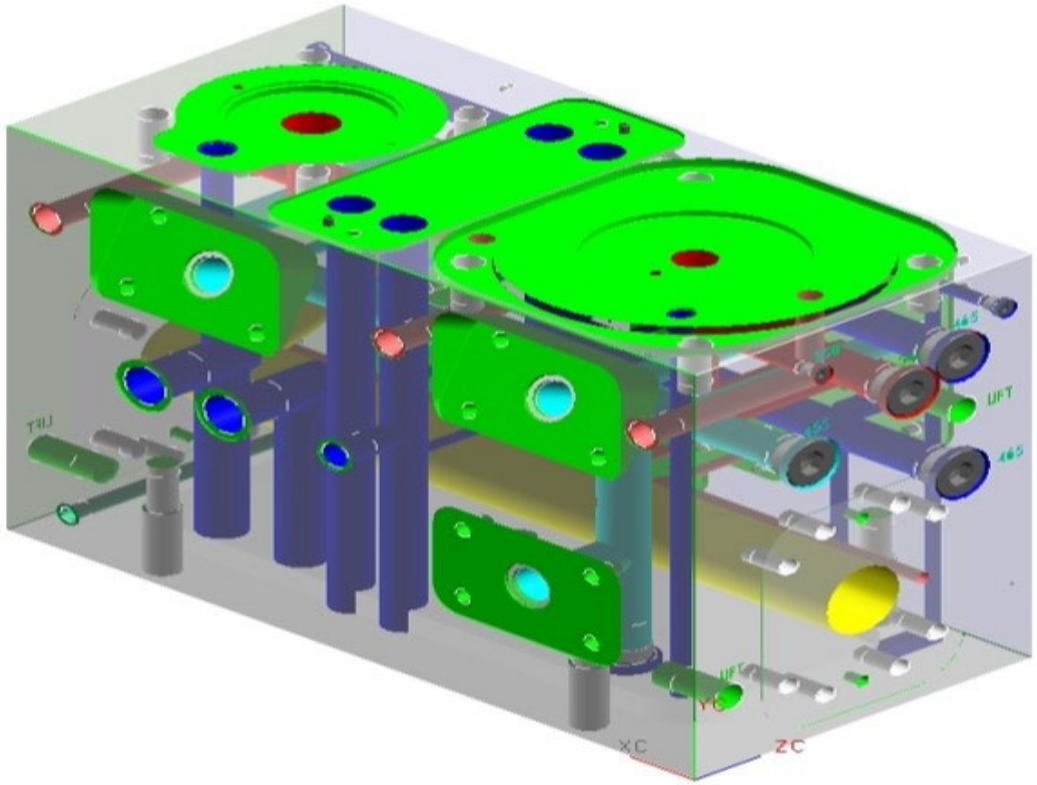
Hydraulic Cylinder Unit (HCU)

Distribution block

Front side

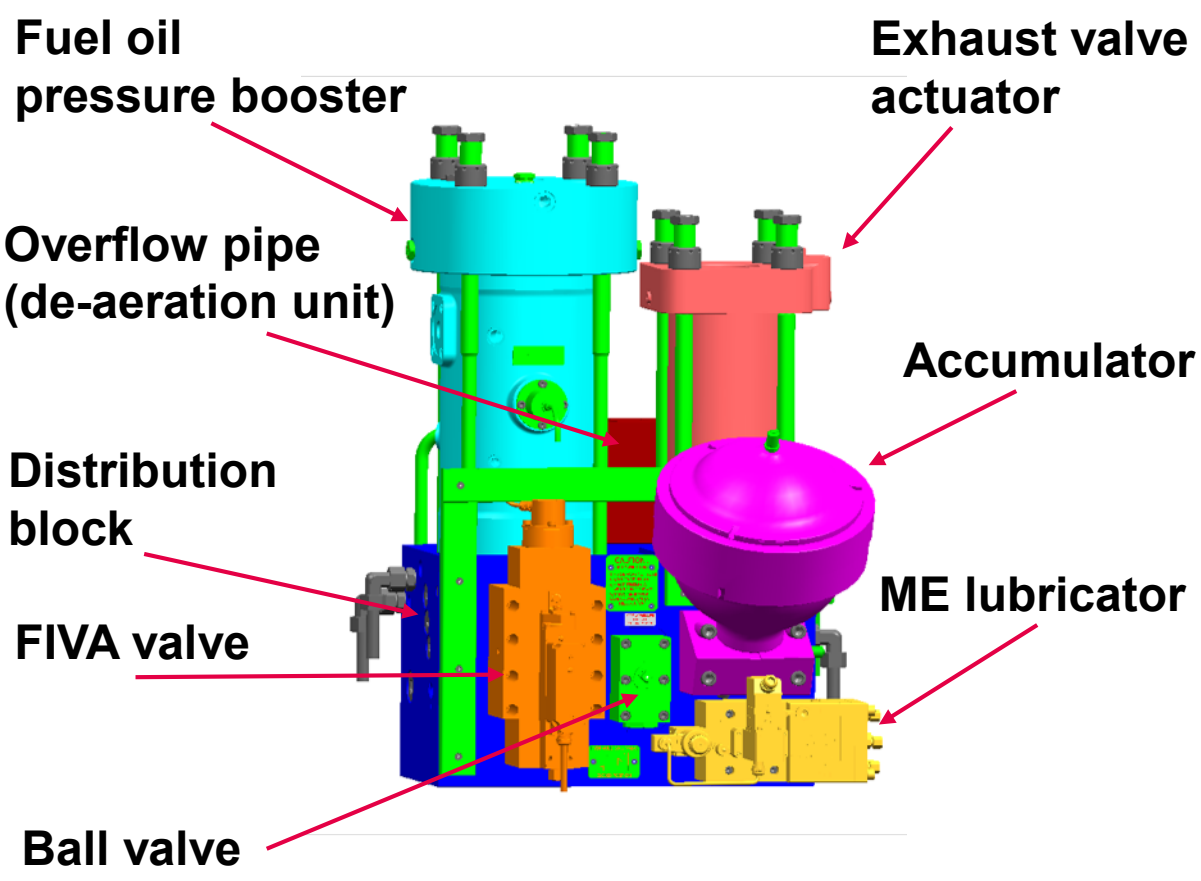


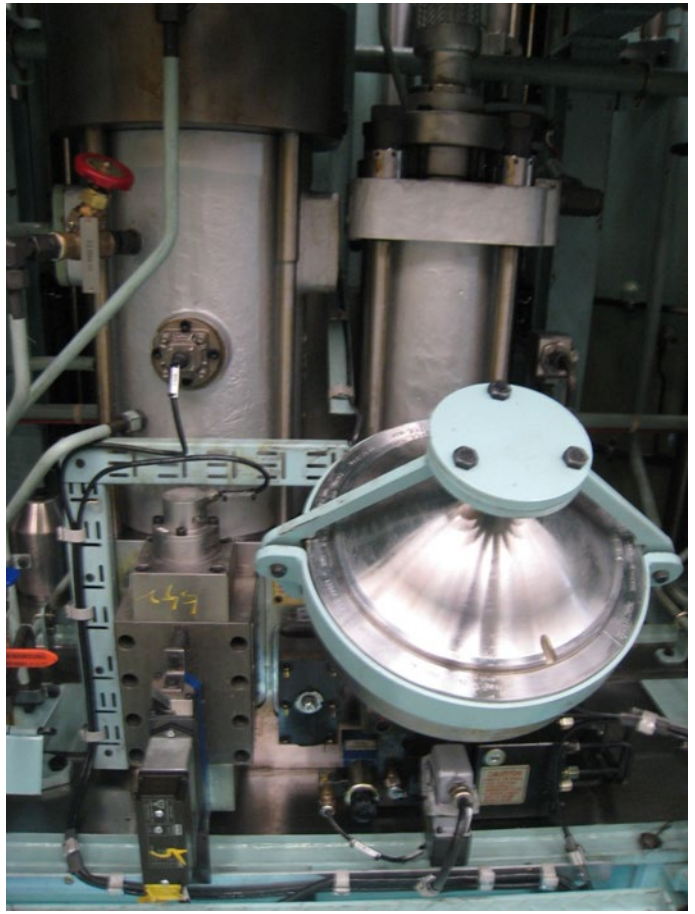
Back side



Hydraulic Cylinder Unit (HCU)

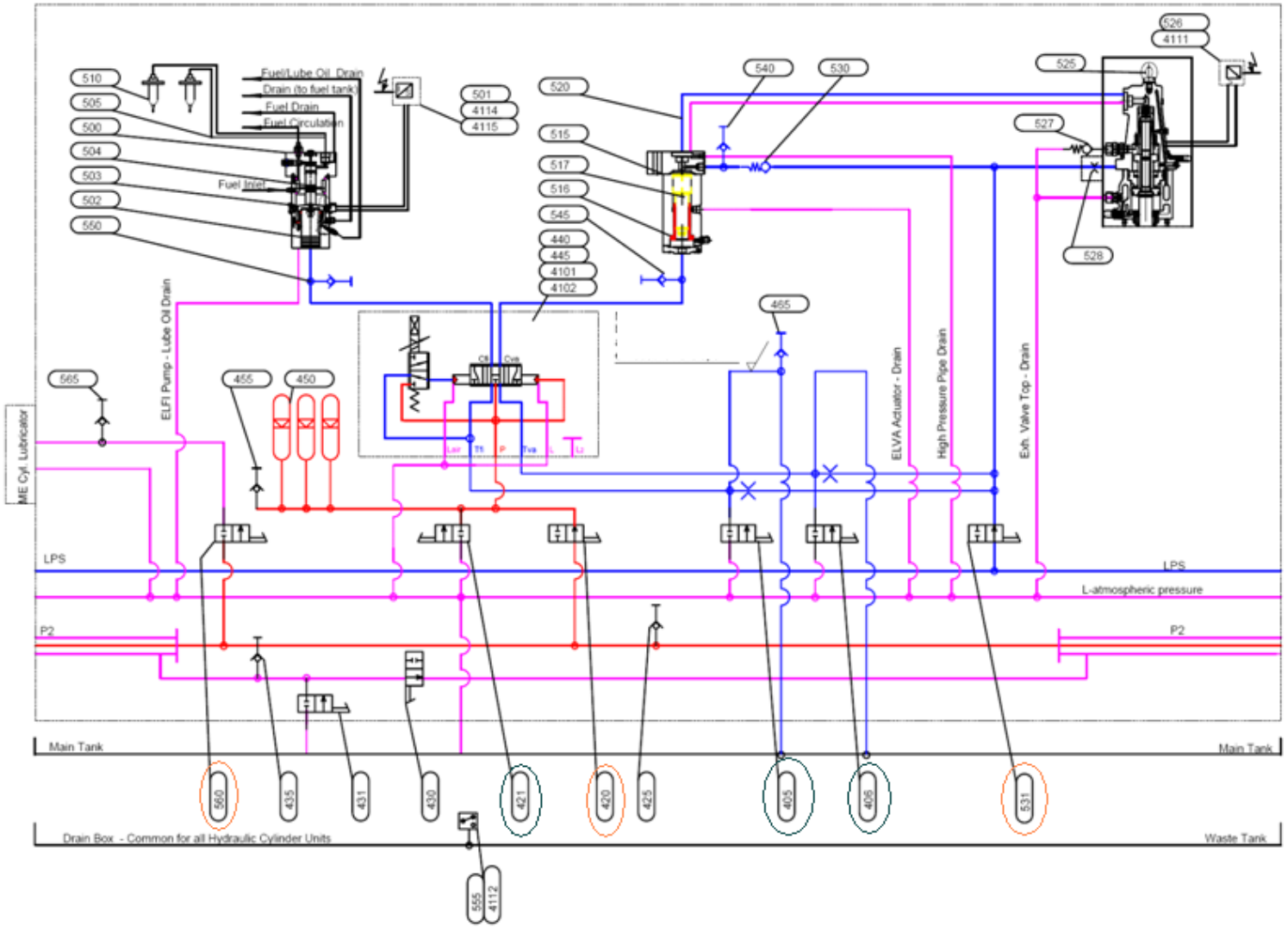
Distribution block





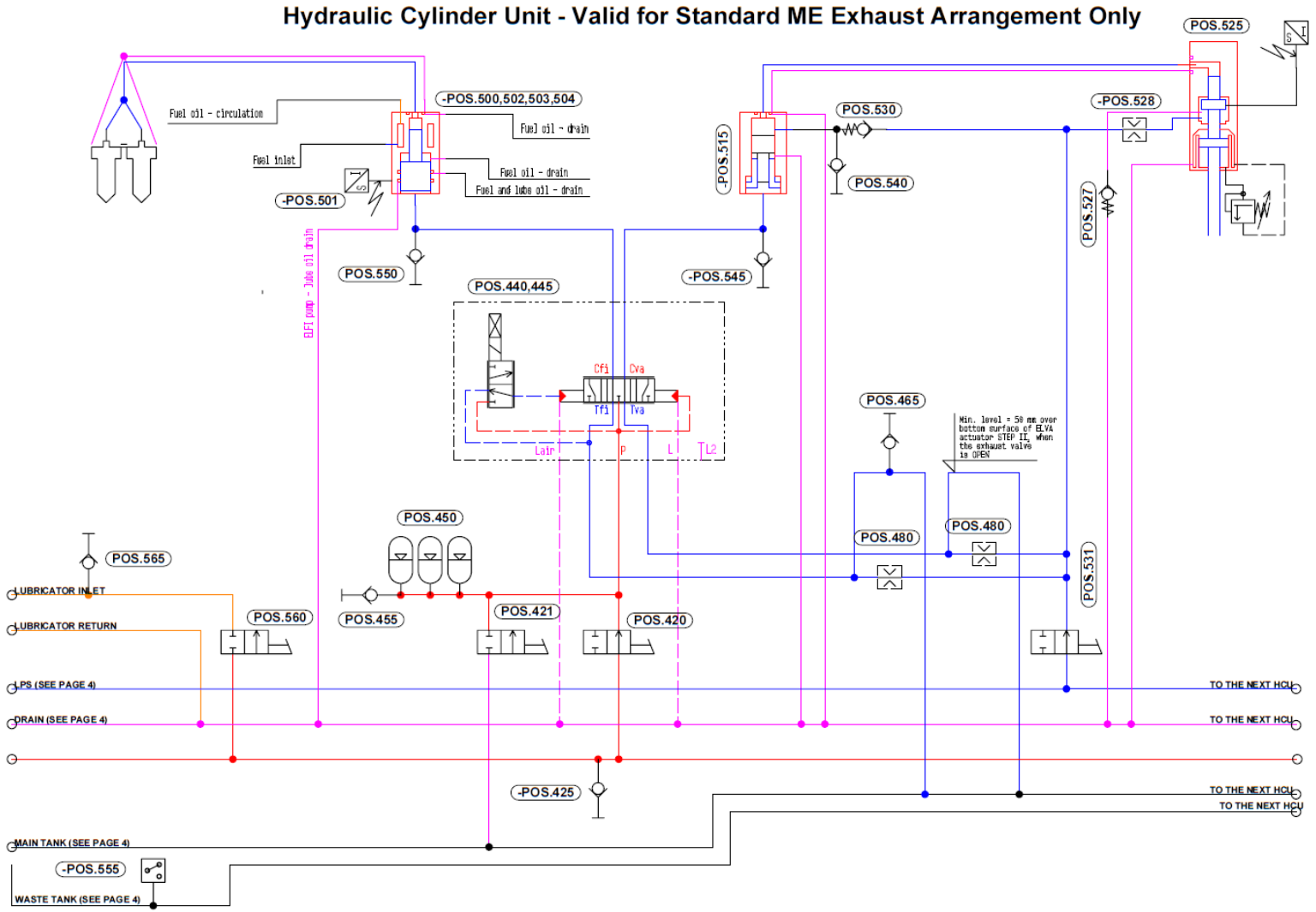
Hydraulic Cylinder Unit (HCU)

Distribution block – 200 bars system diagram



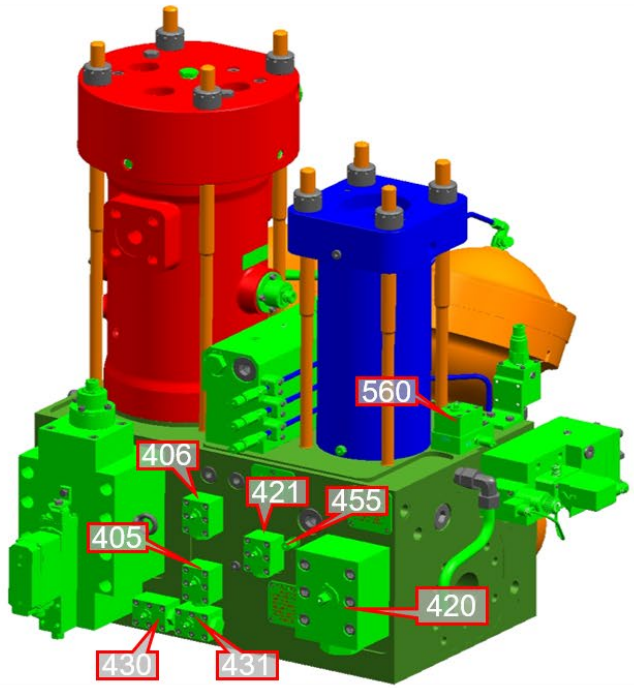
Hydraulic Cylinder Unit (HCU)

Distribution block – 300 bars system diagram



Hydraulic Cylinder Unit (HCU)

Distribution block – 200 bars system valves

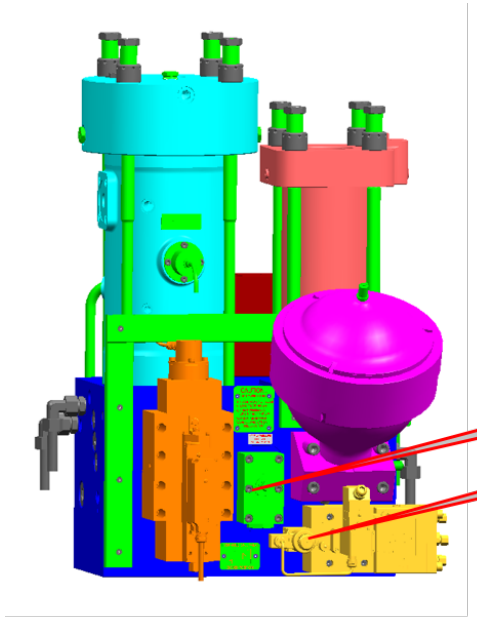


- 405 : Drain valve for FIVA valve
- 406 : Drain valve for FIVA valve
- 420 : Main supply valve of high pressure oil to FIVA valve
- 421 : Drain valve for distribution block
- 430 : Valve for double wall pipe leakage detection
- 431 : Drain valve for outer pipe oil
- 455 : Mini-mess coupling for measurement of the oil pressure (high pressure side)
- 560 : Supply valve of high pressure oil to ME lubricator

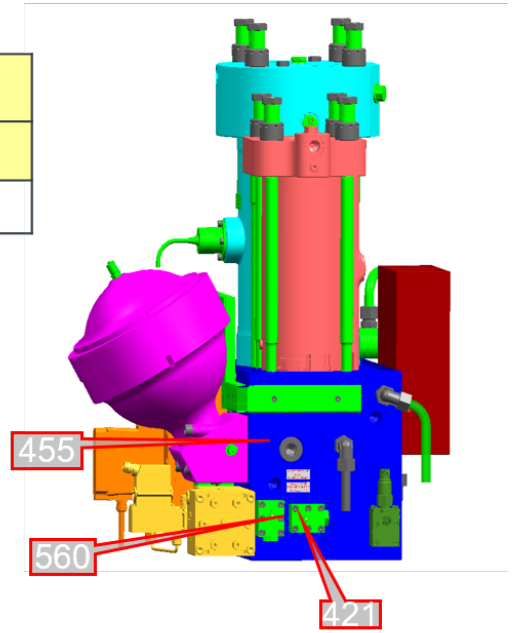
Valve position during normal operation						
405	*406*	*420*	*421*	*430*	*431*	*560*
Closed	*Closed*	*Open*	*Closed*	*Open*	*Closed*	*Open*

Hydraulic Cylinder Unit (HCU)

Distribution block – 300 bars system valves



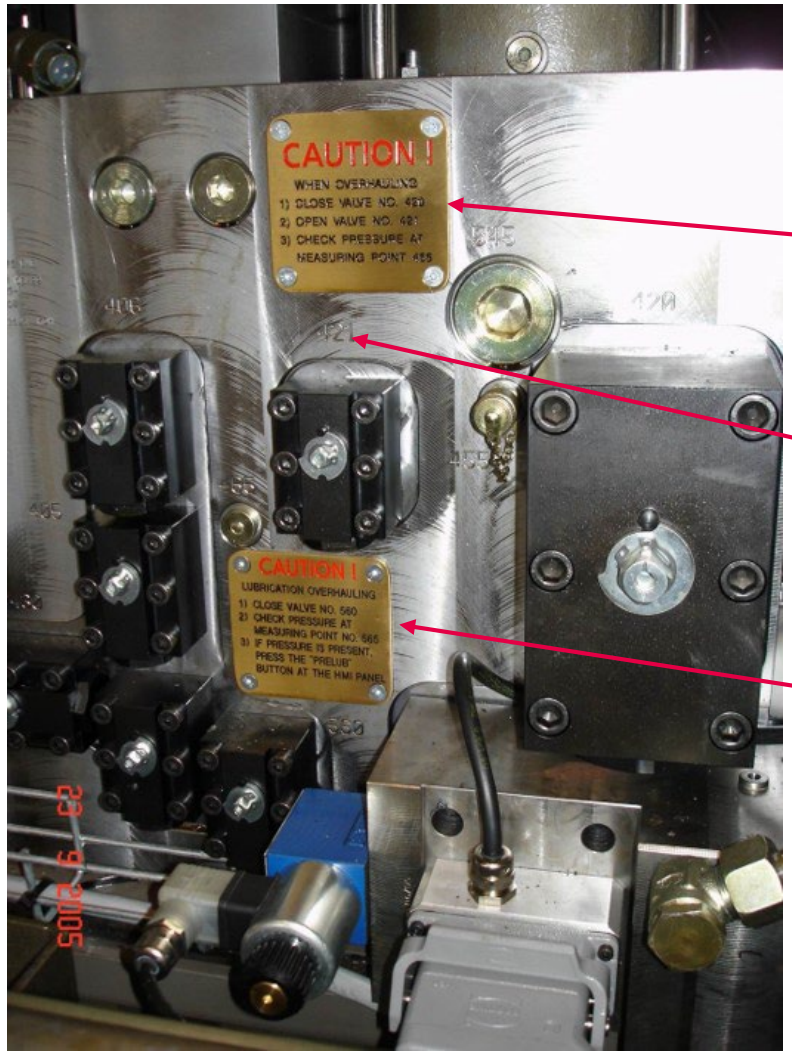
Valve position during normal operation		
420	421	560
Open	Closed	Open



- 420 : Main supply valve of high pressure oil to FIVA valve
- 421 : Drain valve for distribution block
- 455 : Mini-mess coupling for measurement of the oil pressure (high pressure side)
- 560 : Supply valve of high pressure oil to ME lubricator
- 565 : Mini-mess coupling for measurement of the oil pressure (high pressure side)

Hydraulic Cylinder Unit (HCU)

Distribution block – Preparation for maintenance



CAUTION!
HCU OVERHAULING
0. CHECK GAUGE WORKS!
1. CLOSE VALVE NO.: 420, 531
2. OPEN VALVE 421
3. CHECK PRESSURE AT MEASURING POINT 455.
WARNING - NEVER 'OPEN' VALVE WHEN SYSTEM PRESSURE IS 'ON'

Valve No.

CAUTION!
LUBRICATOR OVERHAULING
0. CHECK GAUGE WORKS!
1. CLOSE VALVE NO.:560
2. CHECK PRESSURE AT MEASURING POINT 565.
3. IF PRESSURE IS PRESENT, PRESS THE "PRE-LUB" BUTTON AT THE HMI PANEL

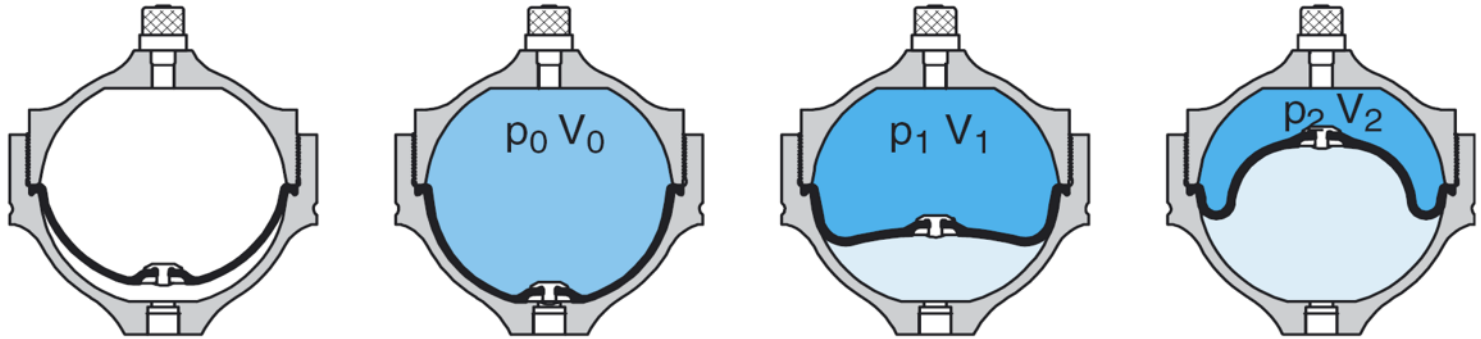
Agenda

Hydraulic Cylinder Unit (HCU)

1. **High pressure pipes**
2. **Distribution block**
3. **Components:**
    1. Accumulators
    2. Lubricator
4. **Lubrication (SL2019 - 671)**

Hydraulic Cylinder Unit (HCU)

Accumulators



WARNING

To protect the accumulator from unnecessary stresses (fast accelleration of the membrane) and oil jets, the valve Pos. 420 must not be opened at pressurised oil system.

After check/overhaul or whatever situation where the valve Pos. 420 has been closed the opening procedure is:

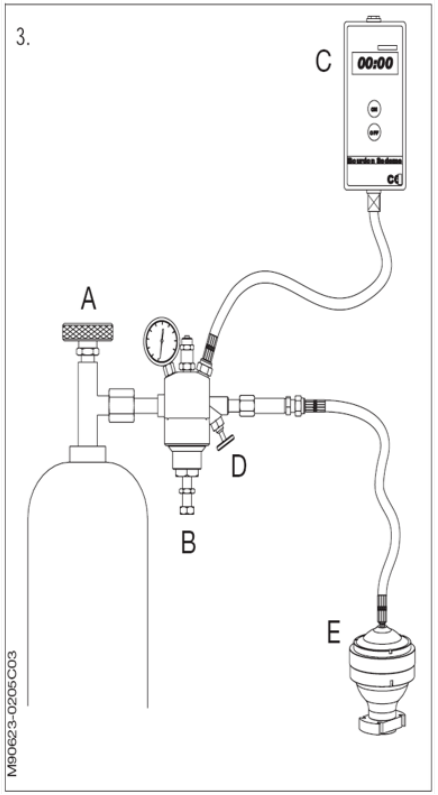
1) The engine must be stopped (no oil pressure)

2) Open/Close all valves into normal running position.

3) Pressurise the system by starting the Start-up pumps.

Hydraulic Cylinder Unit (HCU)

Accumulators – Nitrogen check, SL2019 - 673



The accumulator charge pressure should be checked within the first week of service. Next check should be made minimum every month.

A minor leakage from the accumulators is unavoidable and service experience shows that a pressure drop in the range of 2 - 5 bar / month is to be expected. The charge pressure is dependent on working servo oil pressure as well as the accumulator temperature.

For the 300 bar HPS accumulator charging pressures are:

Ref.	Description	Value	Unit
T45-42	Accumulator	25	kg
T45-43	N2 charging pressure	136	bar at 20°
T45-45	Pressure adjustment table		
	Accumulator temperature t°C		bar
	0	124	bar
	10	130	bar
	20	136	bar
	30	142	bar
	40	148	bar
	50	154	bar
	60	160	bar
	70	166	bar
	80	172	bar
	90	178	bar
	100	185	bar
	Filling pressure must be as stated above		
	Check pressure within ± 5 bar		
T45-46	Assenbly off-set 4-liter accumulator	9	mm
T45-48	Screw, flange to accumulator	80	Nm
T45-49	Screw, flange to hydraulic cylinder unit	50	Nm

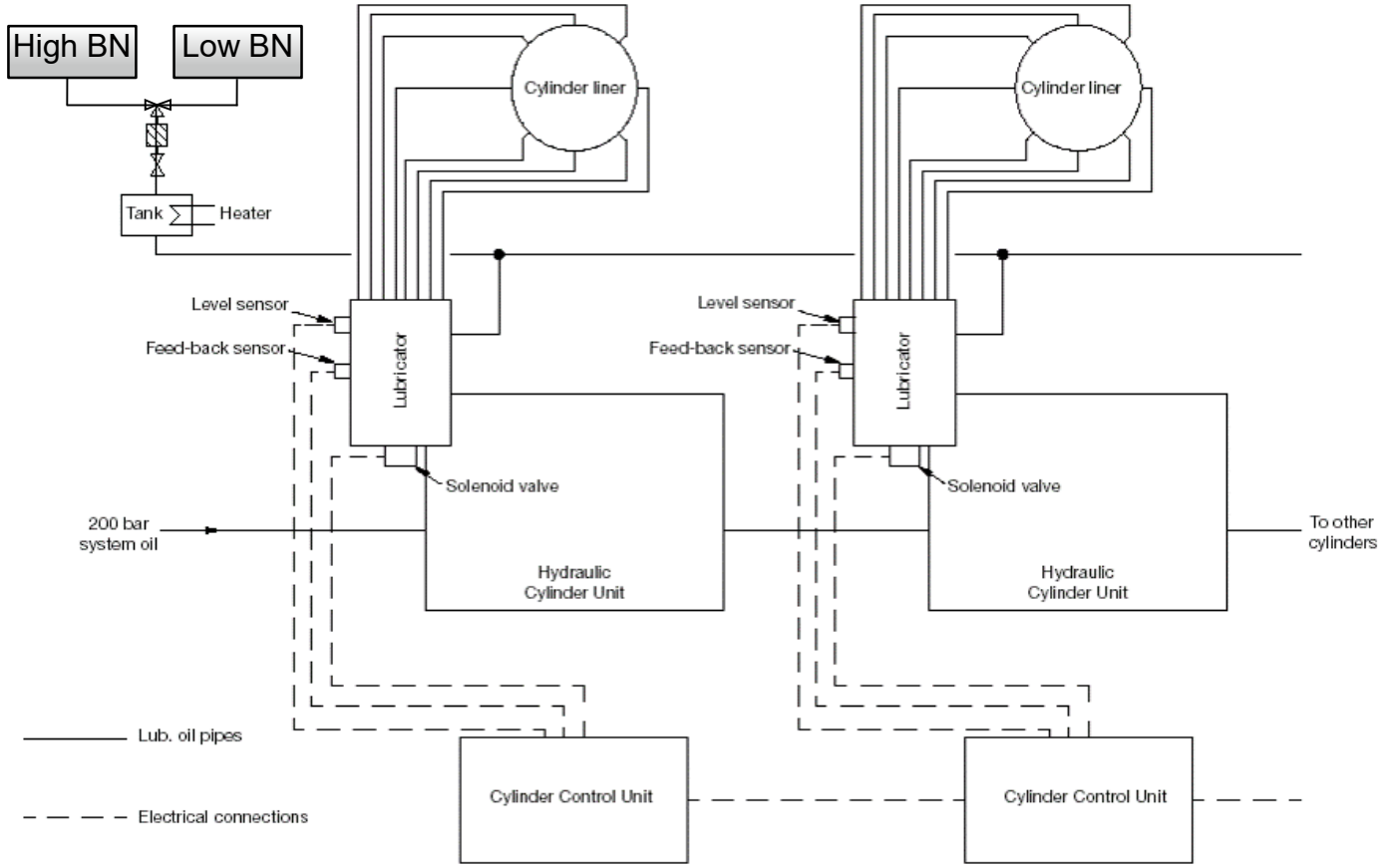
Agenda

Hydraulic Cylinder Unit (HCU)

1. **High pressure pipes**
2. **Distribution block**
3. **Components:**
    1. Accumulators
    2. Lubricator
4. **Lubrication (SL2019 - 671)**

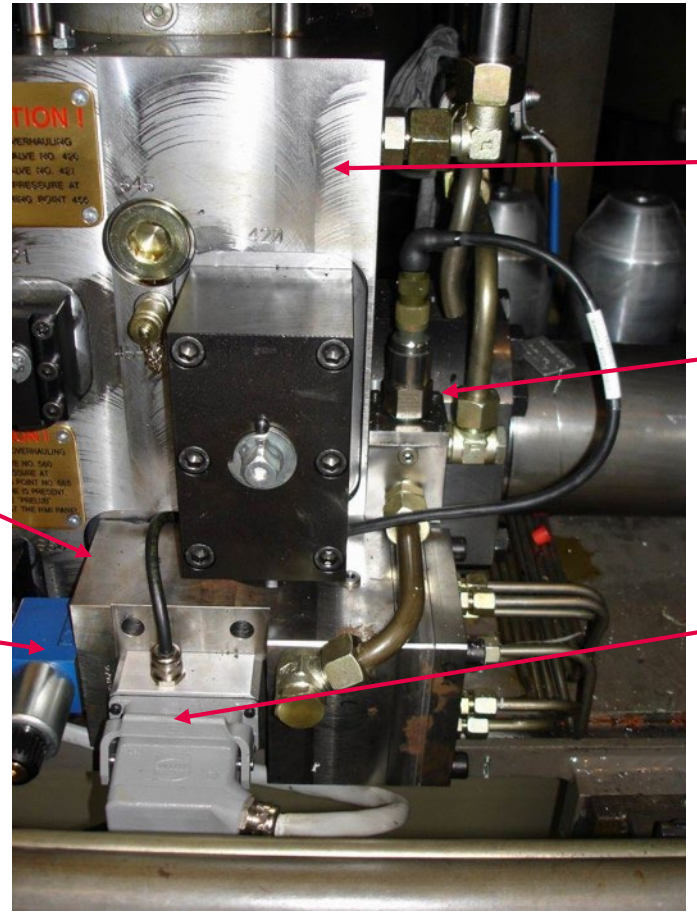
Hydraulic Cylinder Unit (HCU)

Lubricator - Diagram



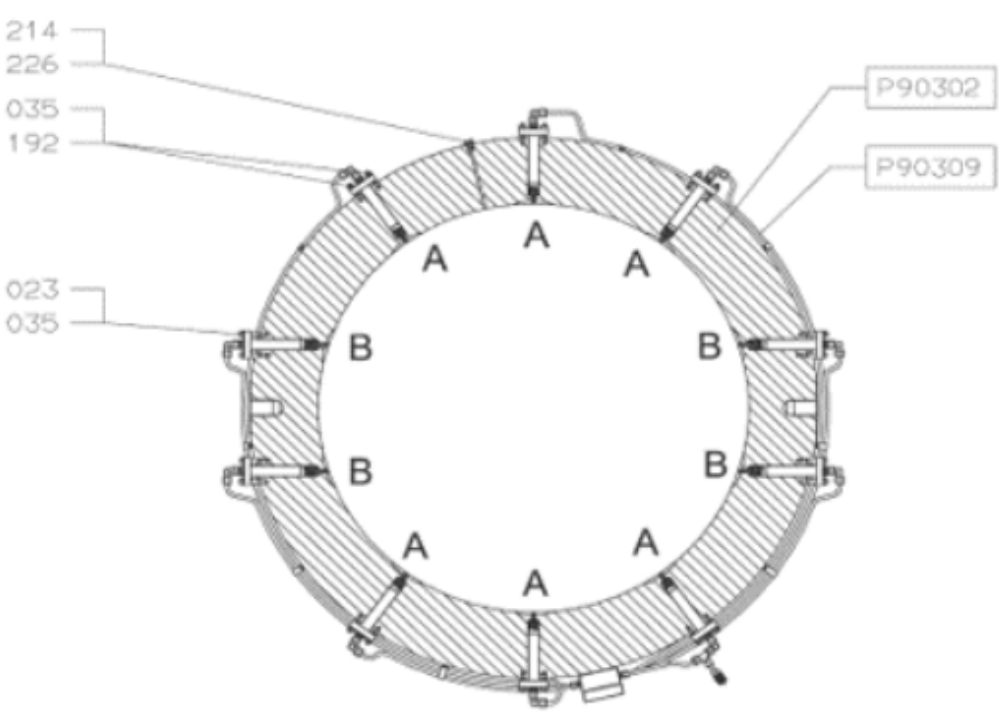
Hydraulic Cylinder Unit (HCU)

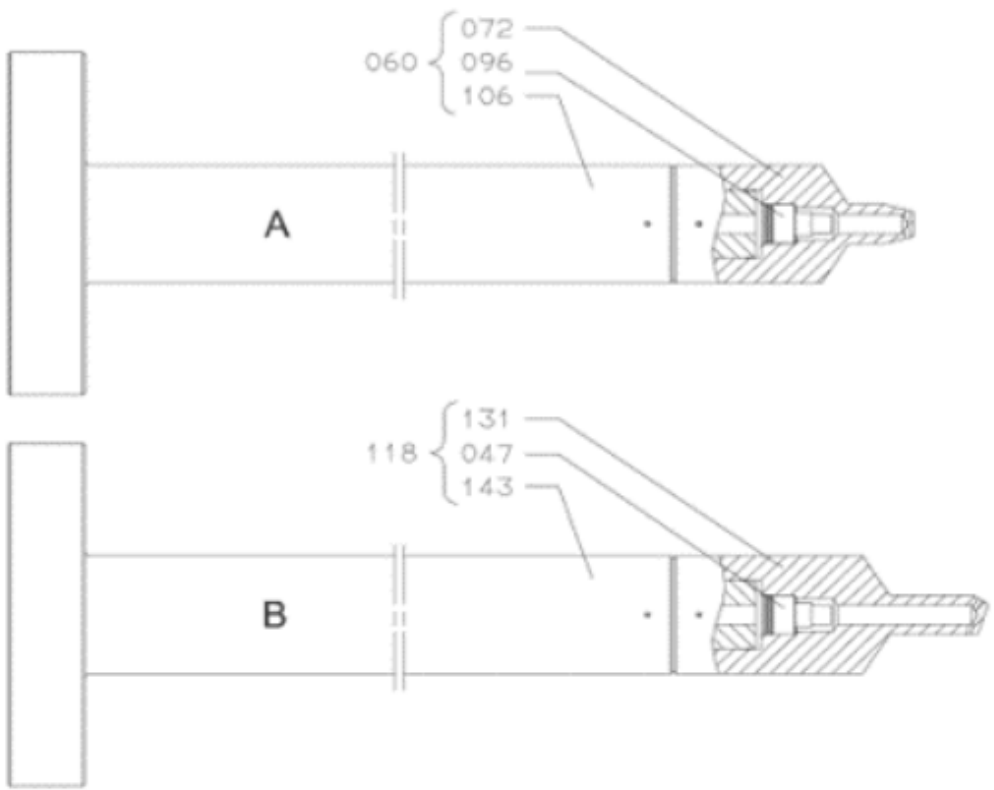
Lubricator - Components



Hydraulic Cylinder Unit (HCU)

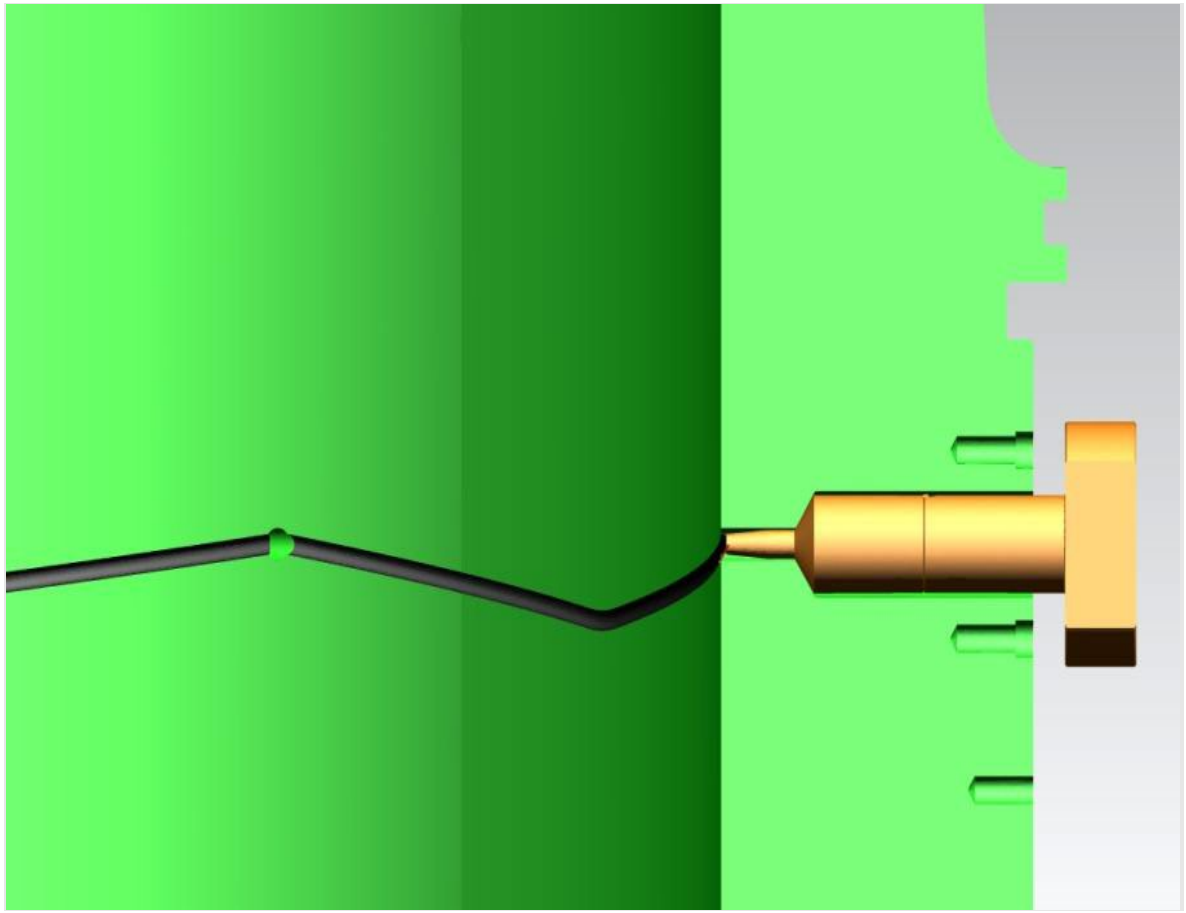
Lubricator – Injection nozzles

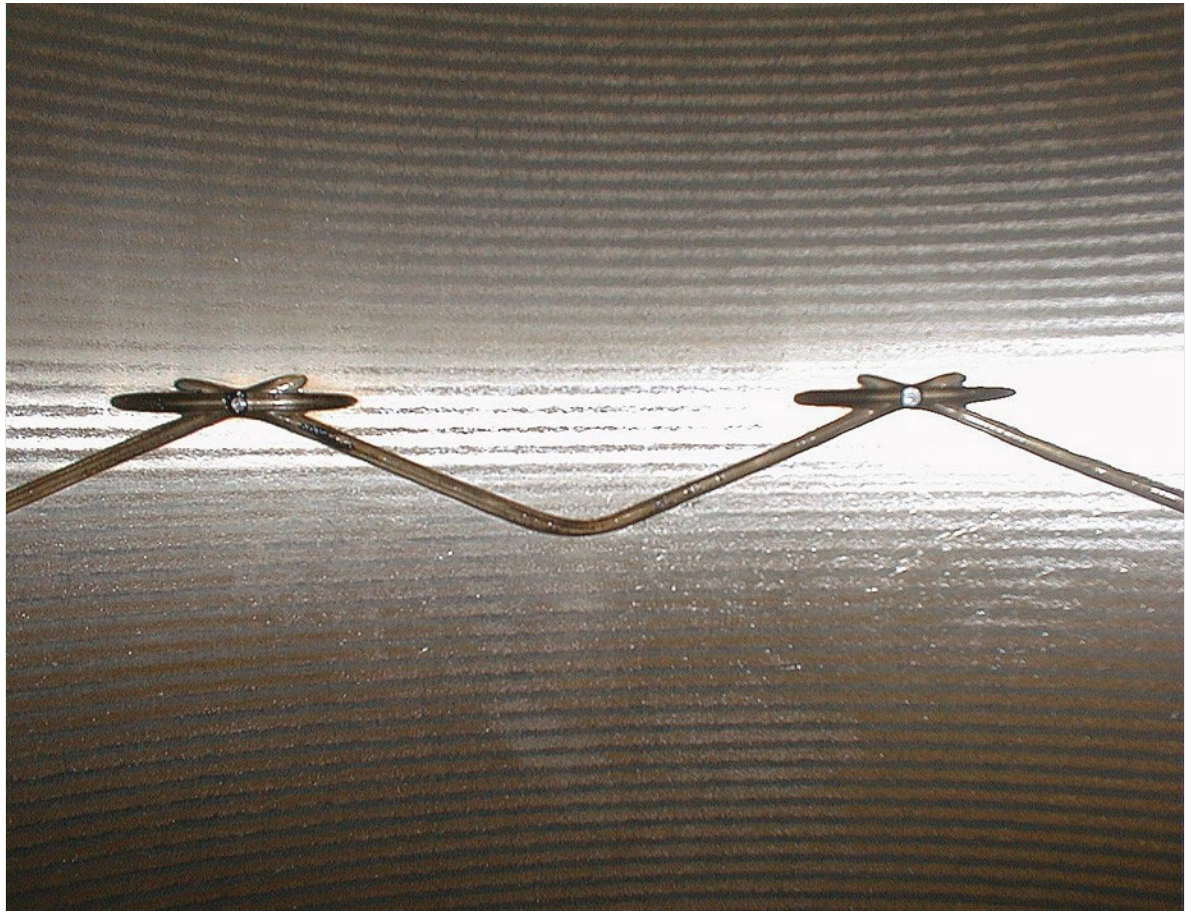




Hydraulic Cylinder Unit (HCU)

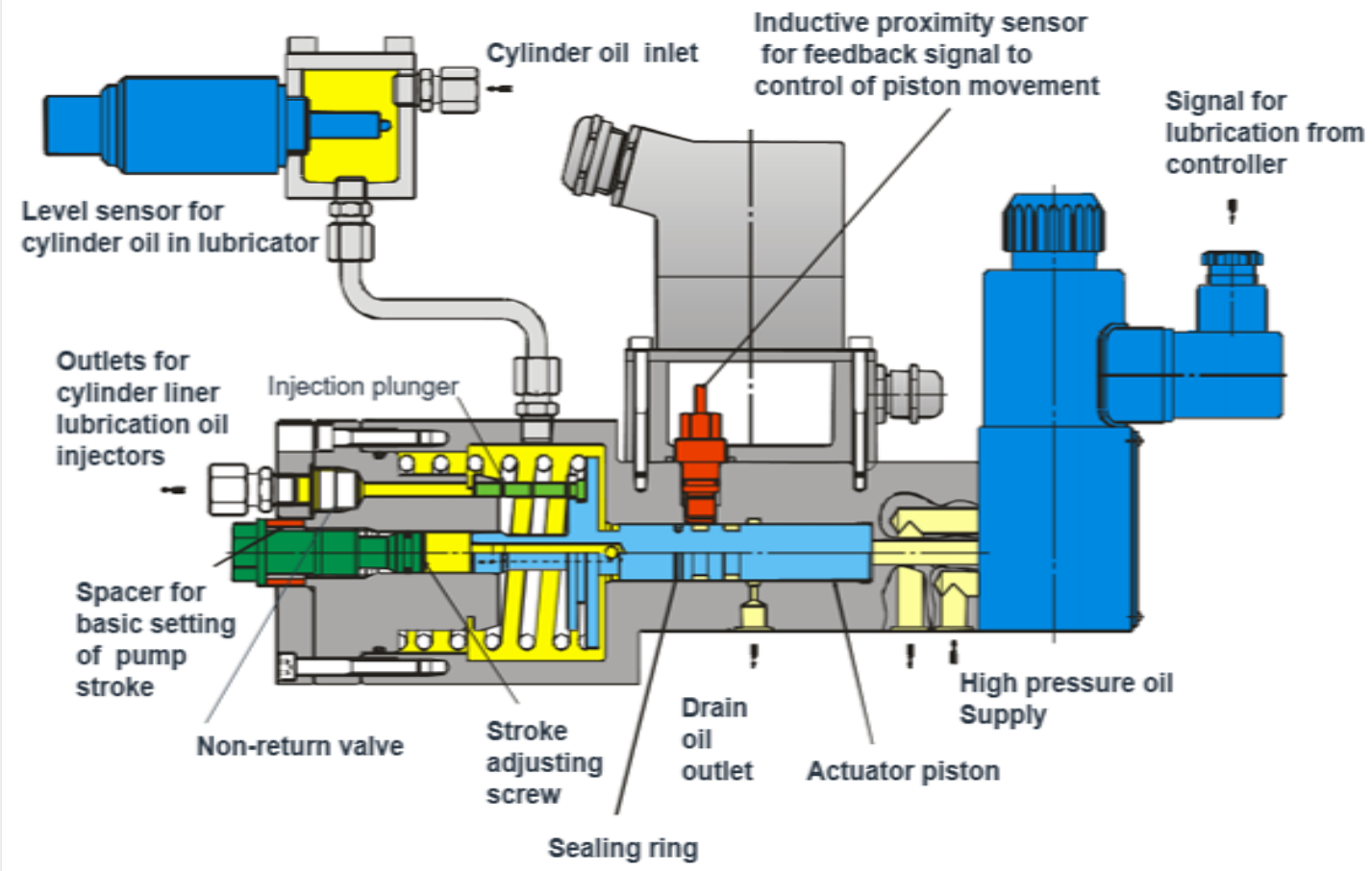
Lubricator – Liner Groves





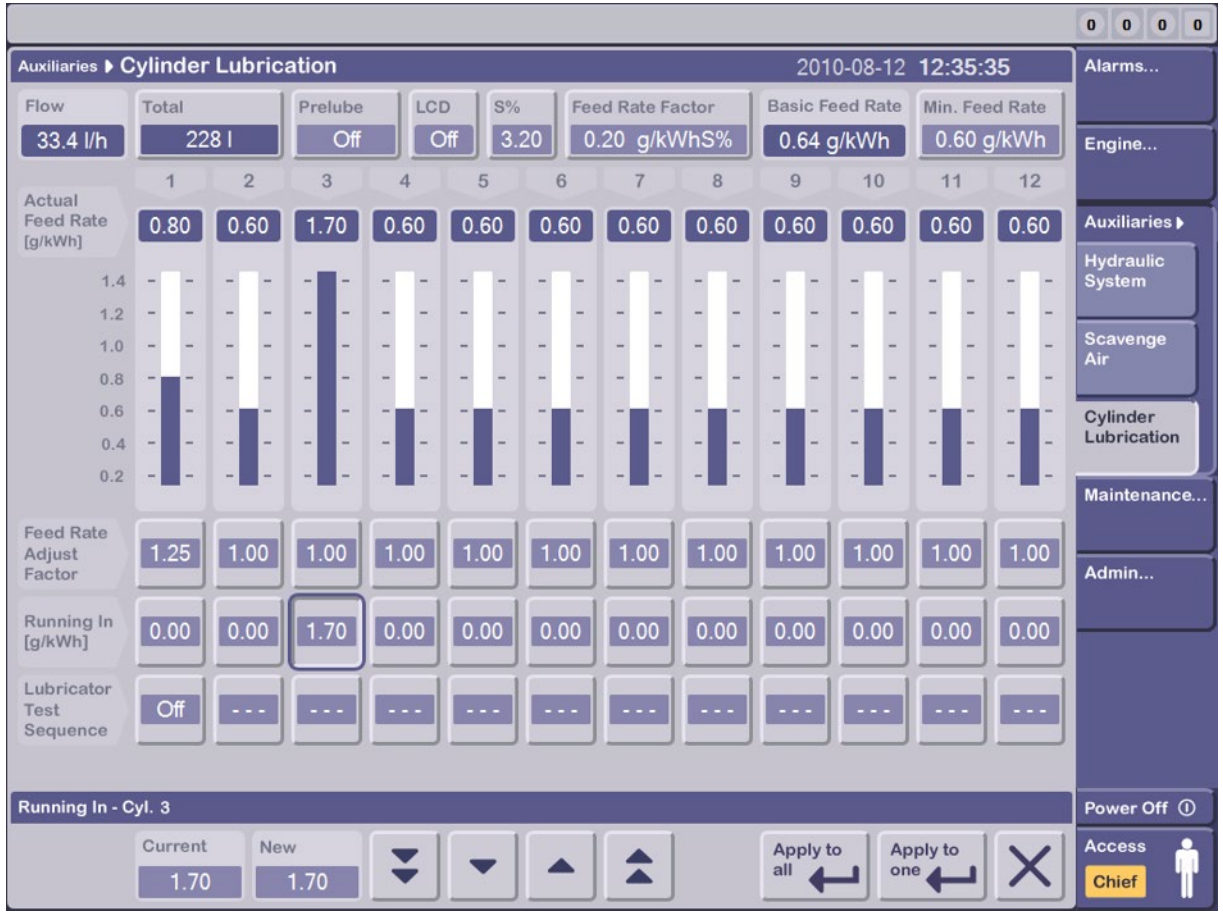
Hydraulic Cylinder Unit (HCU)

Lubricator – ME lubricator design



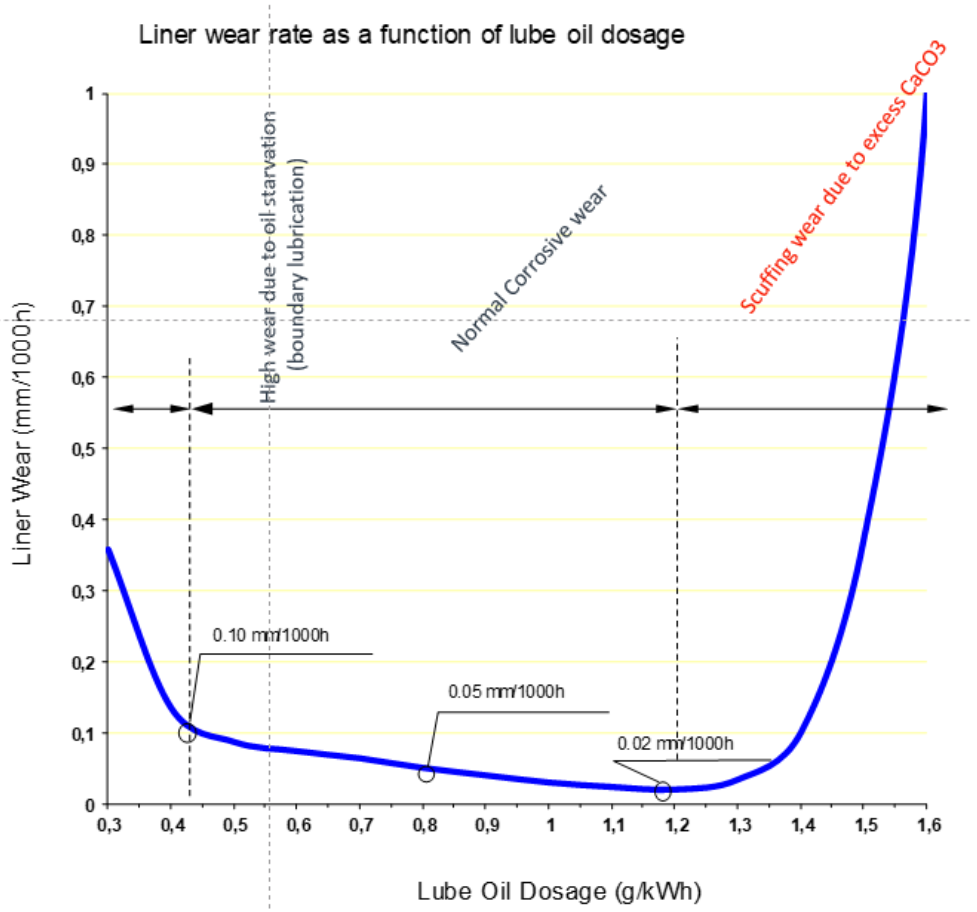
Hydraulic Cylinder Unit (HCU)

Lubricator – Cylinder lubrication screen



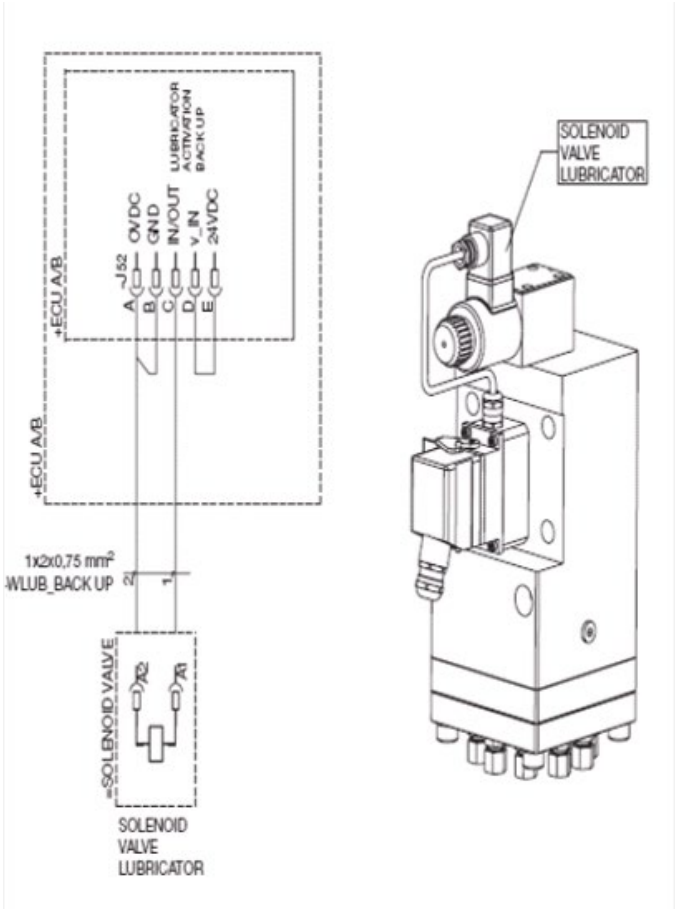
Hydraulic Cylinder Unit (HCU)

Lubricator – Wear rate / Oil dosage



Hydraulic Cylinder Unit (HCU)

Lubricator - Backup



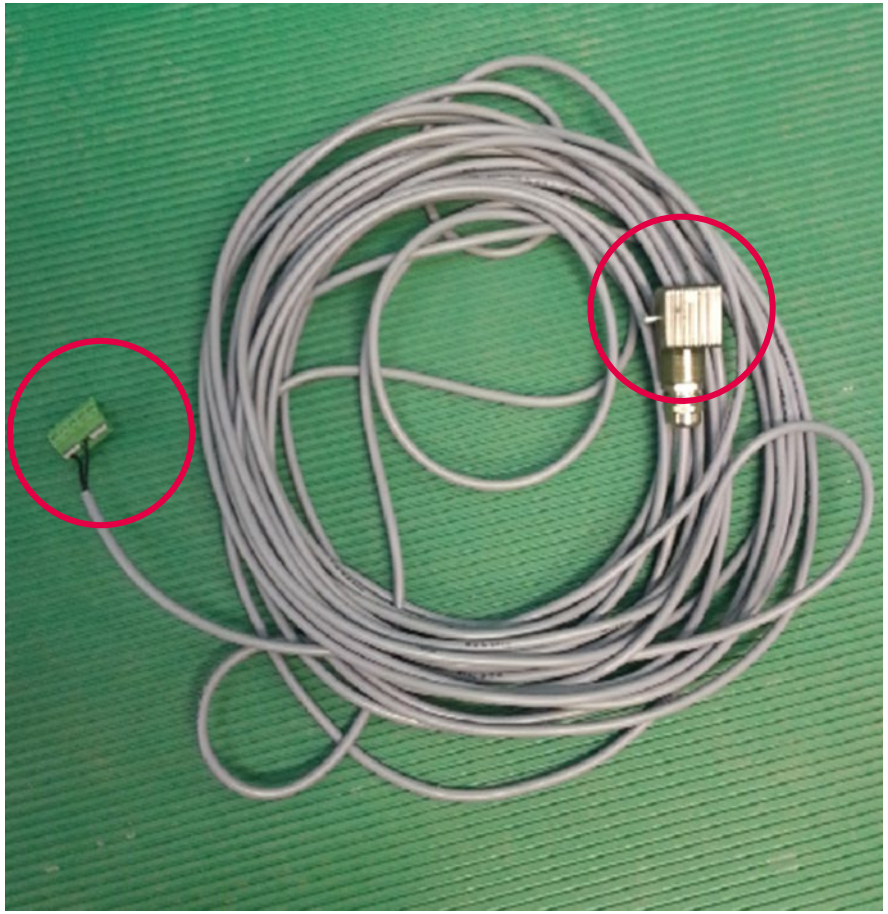
In case of CCU failure where the CCU cannot be changed immediately, the cylinder lubrication can be achieved by a temporary cable from one of the ECU units, plug 52, to the solenoid valve on the lubricator on the unit in question.

The lubrication will be with random timing:

Hydraulic Cylinder Unit (HCU)

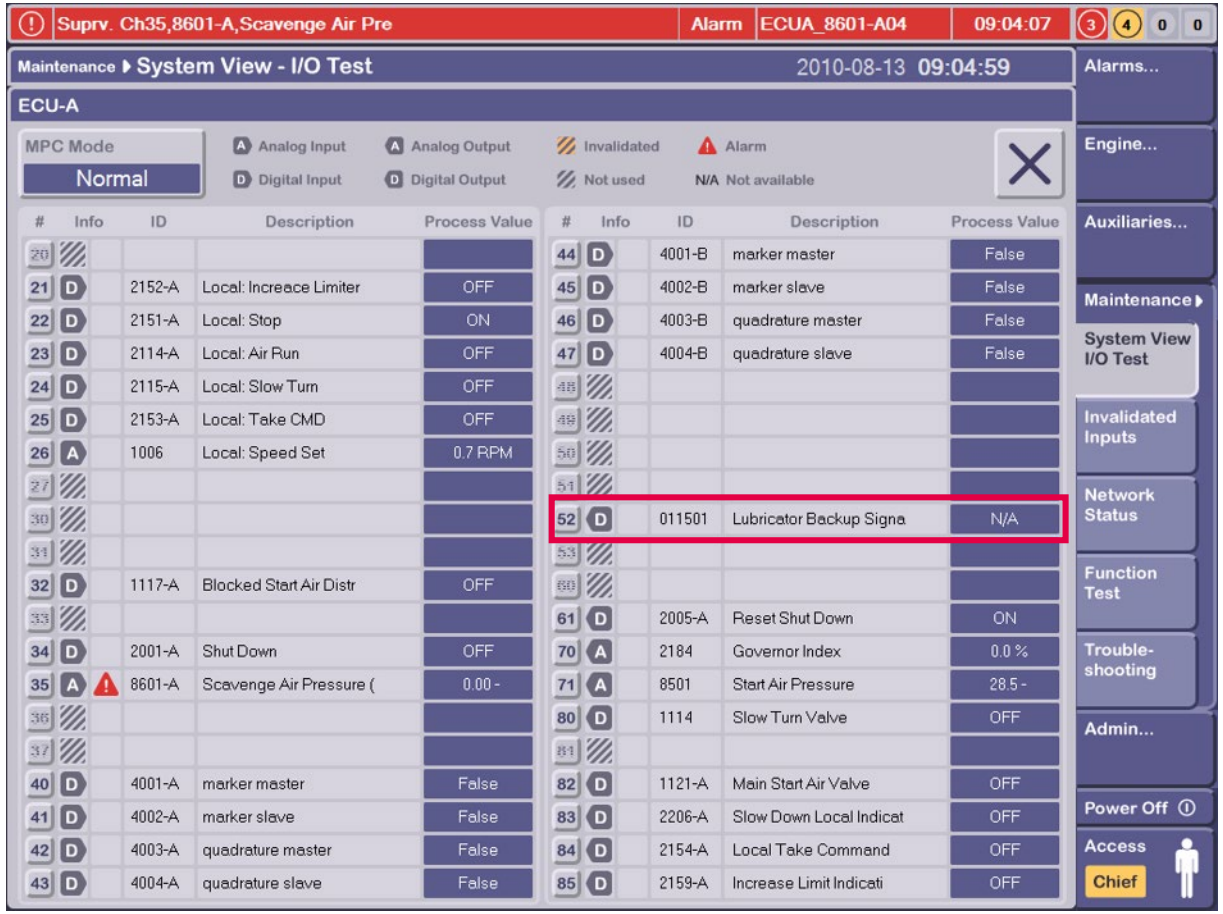
Lubricator - Backup

Cylinder lubrication backup cable



Hydraulic Cylinder Unit (HCU)

Lubricator - Backup



Agenda

Hydraulic Cylinder Unit (HCU)

1. **High pressure pipes**
2. **Distribution block**
3. **Components:**
    1. FIVA
    2. Accumulators
    3. Lubricator
4. **Lubrication (SL2019 - 671)**

Hydraulic Cylinder Unit (HCU)

Lubrication – SL2019 - 671

Service letter SL2019-671/JAP

MAN Energy Solutions

Action code: WHEN CONVENIENT

Cylinder lubrication update for 0 to 0.50% sulphur fuels

SL2019-671/JAP
April 2019

Concerns
Owners and operators of MAN B&W two-stroke marine diesel engines.
Type: All MAN B&W engines

Summary
Check the cylinder condition frequently and ensure that the piston ring pack is clean and moving freely.
In case of deposits, use oil with higher detergency to clean.

General guidance for operation on:
– Max. 0.10% S fuel: 15–25 BN CLO
– 0.10%-0.50% S fuel: 40–70 BN CLO

Guidelines on lubrication when operating on fuel with a sulphur content above 0.50% are found in SL2014-587.

Other relevant Service Letters are:
SL2018-659, SL2019-670, SL2017-638, SL2018-663, SL2014-587

Dear Sir or Madam

This service letter provides operational guidelines on how to lubricate the cylinder and piston when operating on max 0.50% sulphur fuel.

It is expected that the vast majority of all vessels with MAN B&W engines will experience a trouble-free transition to max. 0.50%S fuels. We recommend beginning with 40 BN cylinder oil and evaluating the condition continuously.

In case of deposit build-up, a cylinder oil with higher detergency properties should be considered. For some engines, a lower BN oil will be acceptable whereas others will need to change to a higher BN oil.

For questions or inquiries regarding the content in this letter, contact our Operation department at: Operation2S@man-es.com

Yours faithfully

Mikael C. Jensen
Vice President
Engineering

Stig B. Jakobsen
Senior Manager
Operation

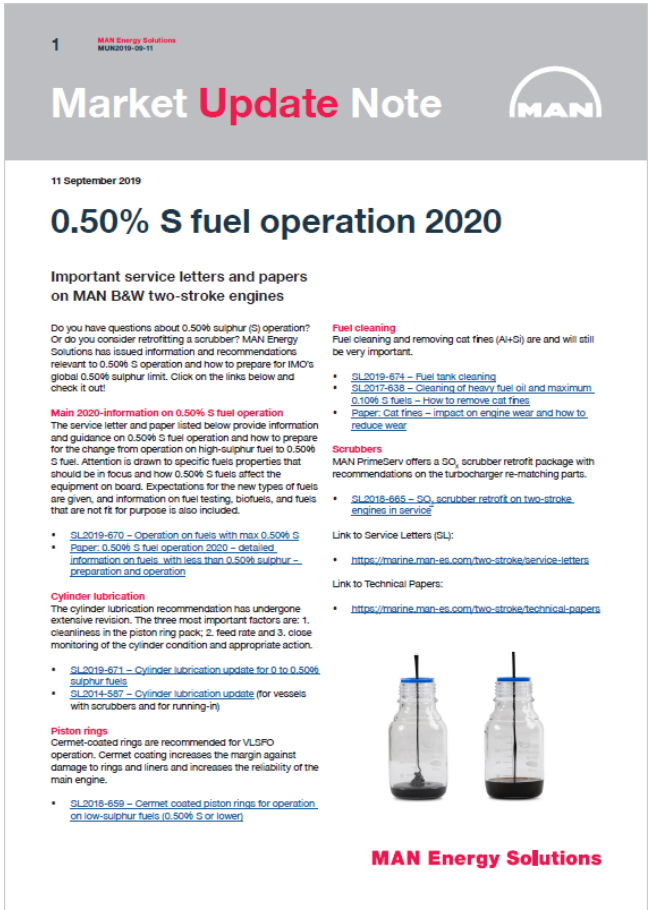
Head office (& po. address) MAN Energy Solutions, Teglholmsgade 41, 2450 Copenhagen SV, Denmark, Phone: +45 33 85 11 00, Fax: +45 33 85 10 30, info-cph@man-es.com, www.man-es.com

PrimeServ Teglholmsgade 41, 2450 Copenhagen SV, Denmark, Phone: +45 33 85 11 00, Fax: +45 33 85 10 49, PrimeServ-cph@man-es.com

Production Teglholmsgade 35, 2450 Copenhagen SV, Denmark, Phone: +45 33 85 11 00, Fax: +45 33 85 10 17, manufacturing-dk@man-es.com

Forwarding & Receiving Teglholmsgade 35, 2450 Copenhagen SV, Denmark, Phone: +45 33 85 11 00, Fax: +45 33 85 10 16, shipping-cph@man-es.com

MAN Energy Solutions Branch of MAN Energy Solutions SE, Germany, CVR No.: 31611792, Head office: Teglholmsgade 41, 2450 Copenhagen SV, Denmark, German Reg.No.: HRB 22956, Amtsgericht Augsburg



1

MAN Energy Solutions
MUN2019-09-11

Market Update Note

11 September 2019

0.50% S fuel operation 2020

Important service letters and papers on MAN B&W two-stroke engines

Do you have questions about 0.50% sulphur (S) operation? Or do you consider retrofitting a scrubber? MAN Energy Solutions has issued information and recommendations relevant to 0.50% S operation and how to prepare for IMO's global 0.50% sulphur limit. Click on the links below and check it out!

Main 2020-information on 0.50% S fuel operation
The service letter and paper listed below provide information and guidance on 0.50% S fuel operation and how to prepare for the change from operation on high-sulphur fuel to 0.50% S fuel. Attention is drawn to specific fuels properties that should be in focus and how 0.50% S fuels affect the equipment on board. Expectations for the new types of fuels are given, and information on fuel testing, biofuels, and fuels that are not fit for purpose is also included.

- SL2019-670 – Operation on fuels with max 0.50% S
- Paper: 0.50% S fuel operation 2020 – detailed information on fuels with less than 0.50% sulphur – preparation and operation

Cylinder lubrication
The cylinder lubrication recommendation has undergone extensive revision. The three most important factors are: 1. cleanliness in the piston ring pack; 2. feed rate and 3. close monitoring of the cylinder condition and appropriate action.

- SL2019-671 – Cylinder lubrication update for 0 to 0.50% sulphur fuels
- SL2014-587 – Cylinder lubrication update (for vessels with scrubbers and for running-in)

Piston rings
Cermet-coated rings are recommended for VLSFO operation. Cermet coating increases the margin against damage to rings and liners and increases the reliability of the main engine.

- SL2018-659 – Cermet coated piston rings for operation on low-sulphur fuels (0.50% S or lower)

Fuel cleaning
Fuel cleaning and removing cat fines (Al+Si) are and will still be very important.

- SL2019-674 – Fuel tank cleaning
- SL2017-638 – Cleaning of heavy fuel oil and maximum 0.10% S fuels – How to remove cat fines
- Paper: Cat fines – impact on engine wear and how to reduce wear

Scrubbers
MAN PrimeServ offers a SO_x scrubber retrofit package with recommendations on the turbocharger re-matching parts.

- SL2018-665 – SO_x scrubber retrofit on two-stroke engines in service

Link to Service Letters (SL):

- https://marine.man-es.com/two-stroke/service-letters

Link to Technical Papers:

- https://marine.man-es.com/two-stroke/technical-papers

MAN Energy Solutions

Disclaimer

All data provided in this document is non-binding.
This data serves informational purposes only and is especially not guaranteed in any way.
Depending on the subsequent specific individual projects, the relevant data may be subject to changes and will be assessed and determined individually for each project. This will depend on the particular characteristics of each individual project, especially specific site and operational conditions.

Intellectual property rights

The intellectual property rights of this work are owned and managed by MAN Energy Solutions and are protected both nationally and internationally according to related laws such as copyright law.

This content is for personal learning and non-commercial use only.
You may not modify or reproduce it except for your personal use.
This content is for training purposes only.
This work is the proprietary intellectual property of MAN Energy Solutions.
MAN Energy Solutions owns all rights to this work and the lecture, and this work is only offered by the instructor or via the MAN eAcademy through the MAN Energy Solutions.
Any use of this work at will, without the consent of MAN Energy Solutions, may cause legal problems.
This work is provided for the convenience of course participant, and it does not give intellectual property rights to user.

MAN Energy Solutions
Future in the making

PrimeServ Academy Copenhagen

MAN PrimeServ