New Sulzer Diesel

Diesel After-Sales Service

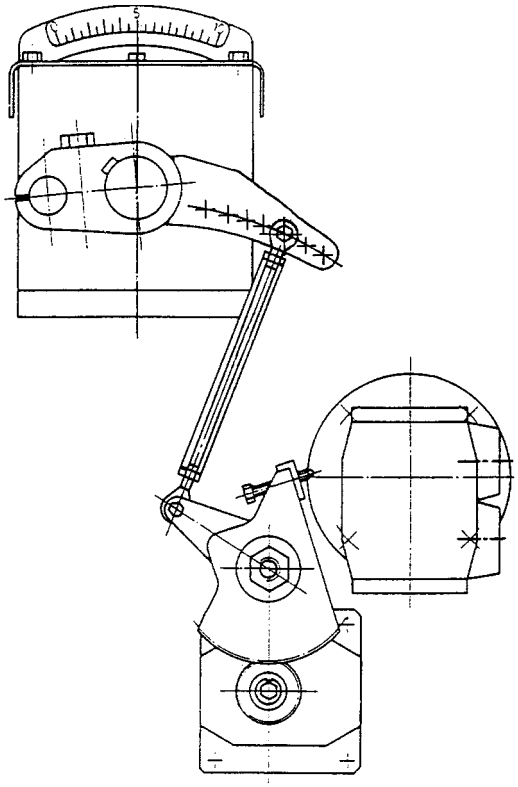
Service Bulletin

RTA–23

10.07.95

Technical Information to all the Owners of Sulzer RTA 38 and RTA 48 Type Diesel Engines

Regulation of Cylinder Liner Lubrication



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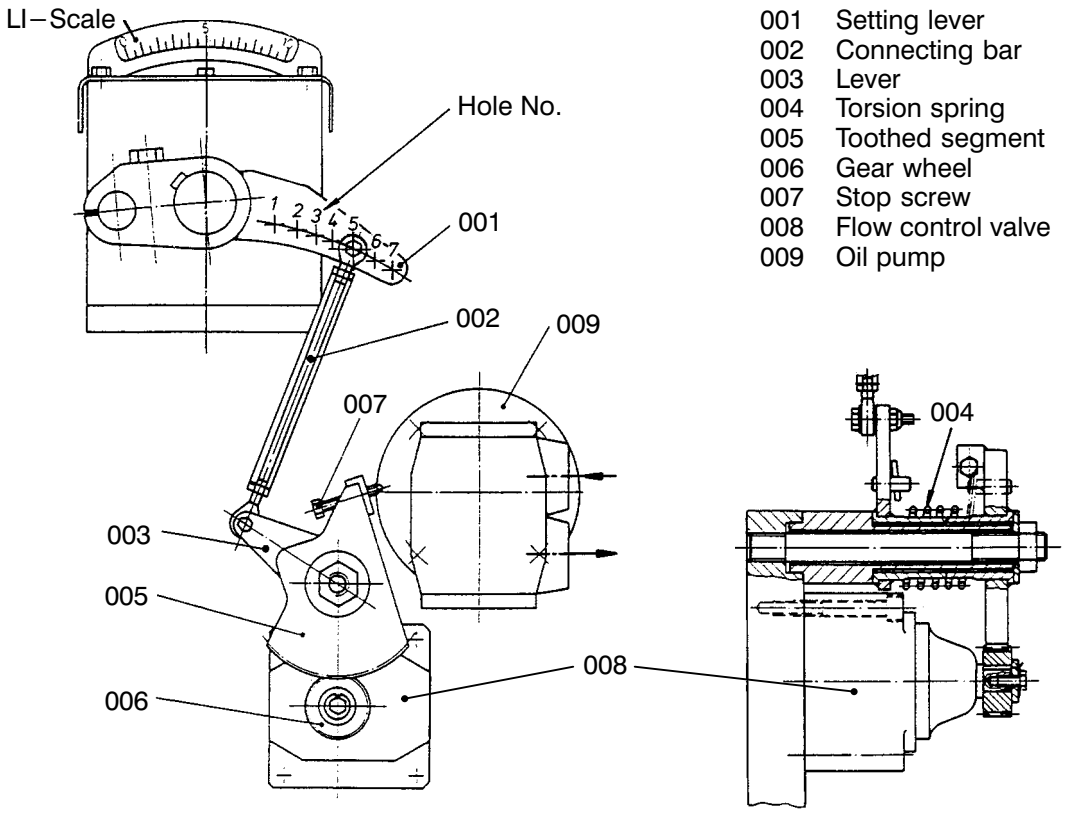
INTRODUCTION

Service experience has shown that in many cases the adjustment of the cylinder lubricators and their drive has not received enough attention, often resulting in disproportionate cylinder lubricating oil feed rates at part−load engine operation, i.e. too high for variable speed engines driving fixed pitch propellers or too low in the case of constant speed engines driving controllable pitch propellers.

This Service Bulletin deals with the setting instructions for the cylinder lubricators, the adjustments to the hydraulic motor and to the linkage and explains how to achieve satisfactory results when setting up the cylinder lubricating oil feed rate.

1. CYLINDER LUBRICATOR DRIVE

Figure: 1



In order to guarantee an accurate cylinder lubricating oil consumption, the speed characteristics of the hydraulic motor must be correctly adjusted.

The speed of the hydraulic motor is, in turn, controlled by the characteristics of the load−dependent flow control valve. The correct basic adjustment is of the utmost importance because of the differing characteristics of individual flow control valves on one hand, and to maintain the required lubricating oil quantity according to the type of engine operation on the other hand (fixed pitch or controllable pitch propeller).

2. NOMOGRAMS

The nomograms enclosed for the load−dependent cylinder lubrication are valid for the effective determination of correct lube oil feed rates. Please refer to enclosure RTA−23 / 1 / 2 for RTA 38 and to RTA−23 / 3 for RTA 48 type engines.

The improved nomograms take into account the differences in characteristics between the individual flow control valves as well as the different load indicator positions for fixed and controllable pitch propellers.

The following improvements have also been included:

- The number of characteristic curves has been increased from 5 to 7 in accordance with the new 7−hole lever which was introduced because the adjustment possibilities with the previous 5−hole lever were found to be too coarse.
  The 5−hole and 7−hole levers are interchangeable but the difference in the hole positions must be considered when adjustments are made. (It is, however, only necessary to exchange the 5−hole lever if the required maximum and minimum specific oil feed rate cannot be achieved).
- The minimum speed of the hydraulic motor is fixed at 50 $\pm$5 rpm after the basic adjustment.
- The settings are checked at 100% load and in addition also at 25% load. In so doing, the specific oil feed rate at 25% load should be 15 − 35% higher than at 100% load. Corresponding examples have been added to the attached nomograms.
- The nomogram of feed rate reduction at the cylinder lubricating oil pumps has been corrected.
- The details for the recommended specific cylinder lube oil feed rate have been omitted and now appear in ”RUNNING−IN GUIDELINES FOR RTA 38 AND RTA 48 TYPE ENGINES” (consult enclosures RTA−23 / 4A and 4B).

3. CHECKING OF THE SETTINGS

Basically, the settings of the cylinder lubrication have to be checked from time to time, mainly to learn whether or not the correct amount of cylinder lubricating oil is used. It is sometimes necessary to make some minor adjustments; this should be done without disturbing the basic settings of the linkage or the mesh between the toothed segment and the gear wheel.

Minor adjustments should only be carried out on the adjusting screws of the pumps or by changing the fulcrum by moving the connecting bar one hole up or down on the setting lever.

For your convenience, we have listed below the setting and checking procedures of the load−dependent cylinder lubrication.

4. SETTING THE LOAD–DEPENDENT CYLINDER LUBRICATION

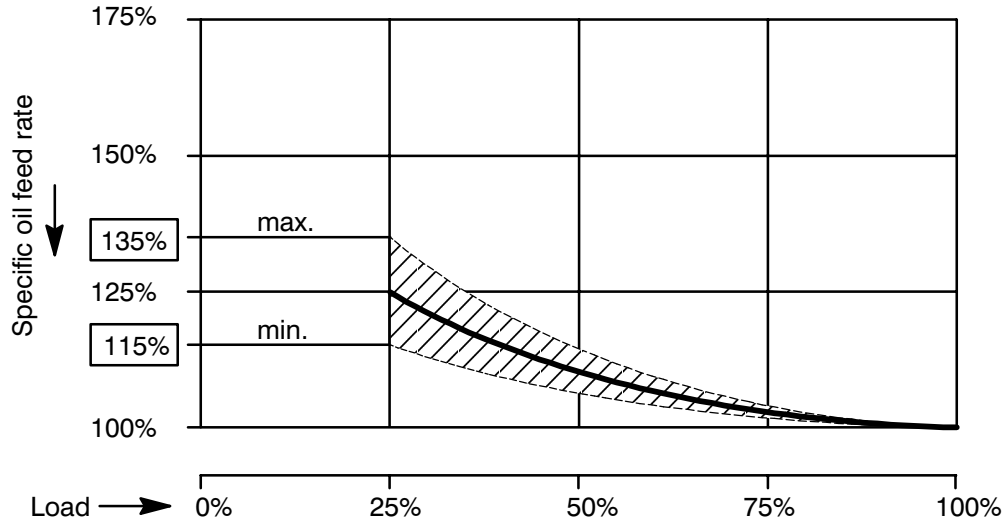
The basic settings described are generally made before the acceptance trial run of the engine but are also used as guidelines for the periodical checking of the settings at a later date.

For determining the required rate of lubricating oil supply, please consult the respective nomogram on enclosures RTA–23 / 1 / 2 / 3. Depending on the type of engine operation, the corresponding setting ranges (for fixed or controllable pitch propellers) must be chosen.

4.1 Specific Lubricating Oil Supply Rate to be aimed for at Part Load

The flow control must be set in such a way that for the part load range the specific lubricating oil feed increases. The general requirement must be that the specific oil delivery (g/kWh) at 25% load has to be 15 to 35% higher than at 100% load (see Figure 2 below).

Figure: 2



With the aid of the NOMOGRAM the specific oil delivery at 25% load must be compared to that at 100% load.

The characteristic of the flow control valve (008) must be varied till the rise in the oil delivery rate remains within the specified tolerance limit (see enclosures RTA–23 / 1 / 2 / 3).

4.2 Setting of Regulating Components

4.2.1 Setting the Hydraulic Motor Basic Speed (Engine idling)

Loosen the fixation of the toothed segment (005) and turn the stop screw (007) back until the **basic speed RPM/Hydraulic Motor = 40 rpm** has been attained. Mark this position on the gear wheel (006) opposite the flow control valve (008).

4.2.2 Fitting the Connecting Bar (with Engine at standstill)

Depending on the type of engine operation and while keeping the connecting bar reference length unchanged (for RTA 38 L=205mm or L= 230mm respectively for "EC 38 control", RTA 48 L=215mm), hook the connecting bar (002) into setting lever (001) and into lower lever (003) as follows:

- For engines with fixed pitch propellers (FPP) into hole No. 5 (No. 4)*
- For engines driving controllable pitch propellers (CPP) or electric generators into hole No. 3 (No. 2)*

* Hole No. in brackets applies to 5−hole levers.

4.2.3 Checking the Load Indicator Position (with Engine at standstill)

Bring the complete regulating linkage to stop and set the gear wheel marking (according to point 4.2.1).

The load indicator must now be **between Pos. 3 and Pos. 3.5**

Deviations from this value must be corrected in the following manner:

a) By modifying the length of the connecting bar (002) by max. ±3mm as per point 4.4.1

b) By changing the teeth meshing as per point 4.4.2, keeping the marked gear wheel position as per point 4.2.1 and by adjusting the stop screw (007)

Note: The torsion spring (004) may not be additionally loaded (see also point 4.6.1)

4.3 Measuring and Recording the Hydraulic Motor Speed

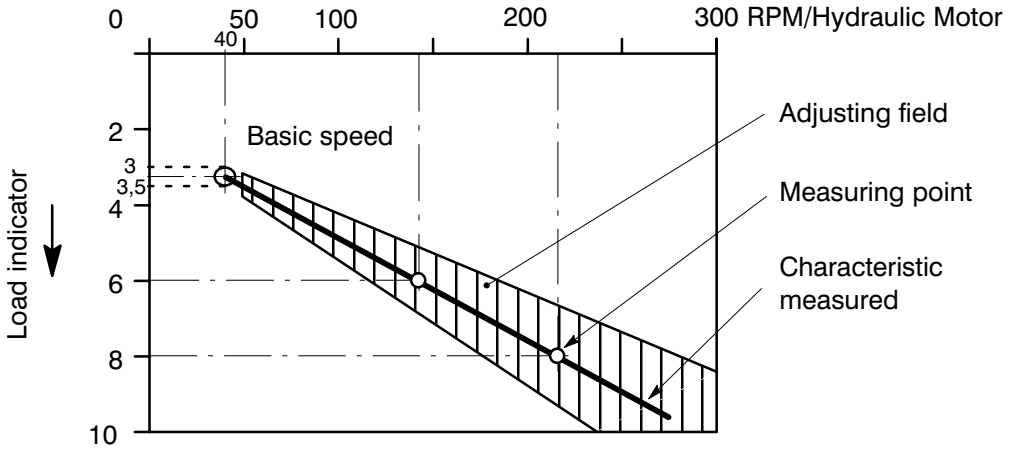
Measuring must be carried out on the running engine and in accordance with the intended operational duty (FPP or CPP).

4.3.1 Measuring the Upper Hydraulic Motor Speed

Raise the engine load step by step and at the same time measure the hydraulic motor speed at least twice.

Enter the load indicator position values and the hydraulic motor speed readings established in this manner into the respective NOMOGRAM (Enclosures RTA−23 / 1 / 2 / 3) "Characteristic of flow control valve". The line connecting the lower and upper measured points represents the adjusted characteristic line (please refer to Figure 3 below).

Figure: 3



4.3.2 Guiding Value for Characteristic

To maintain the specific lubricating oil supply rate specified under point 4.1, the characteristic line must lie within the adjusting field.

In case of a deviation, the slope of the characteristic must be corrected primarily by changing the connecting bar (002) to another hole (see point 4.4.3).

4.4 Possibilities for Correction and Fine Settings

Corrections should , as a matter of principle, only be carried out with the engine at standstill.

It is also recommendable to estimate beforehand in which direction (RPM/ Hydraulic Motor + or −) and of what magnitude the correction must be undertaken.

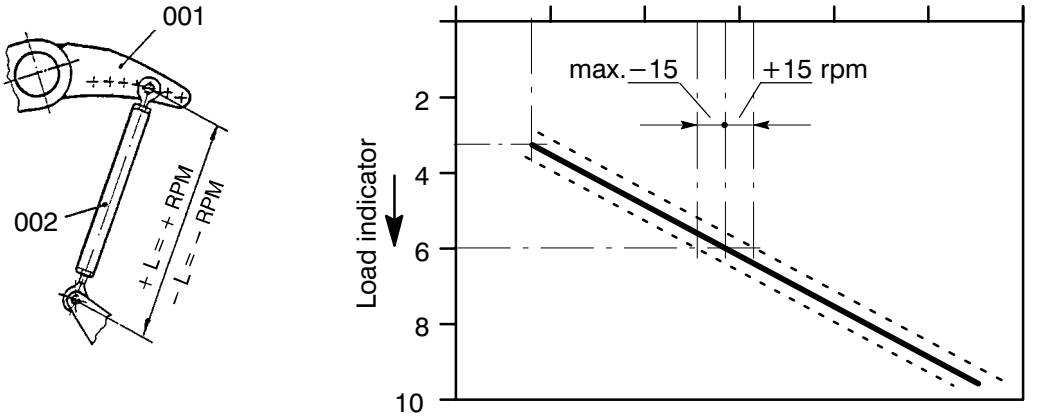
4.4.1 Adjusting the Length of the Connecting Bar (Fine Setting)

By lengthening or shortening the connecting bar (002), a parallel shift of the characteristic line is achieved.

The alteration of length ”L” can only be achieved by 1/2−turns of the jointed heads (having a right hand thread on both ends). Corresponding possible length alterations: 1/2−turn = 0,625 mm ⟶ RPM/Hydraulic Motor = 3 rpm.

The length of the connecting bar (002) may only be changed by a max. of ± 3 mm.

Figure: 4



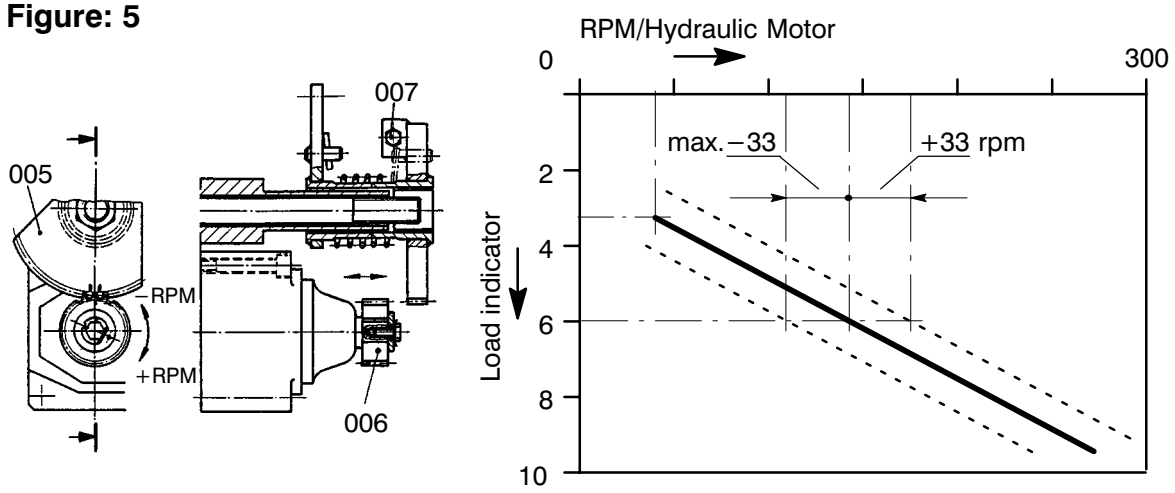
4.4.2 Changes in the Tooth Mesh (Coarse Setting)

Displacing the gear wheel (006) relative to the toothed segment (005), also produces a parallel shift of the characteristic line.

1 Tooth ⟶ RPM/Hydraulic Motor = 33 rpm

(Please refer to Figure 5 on next page)

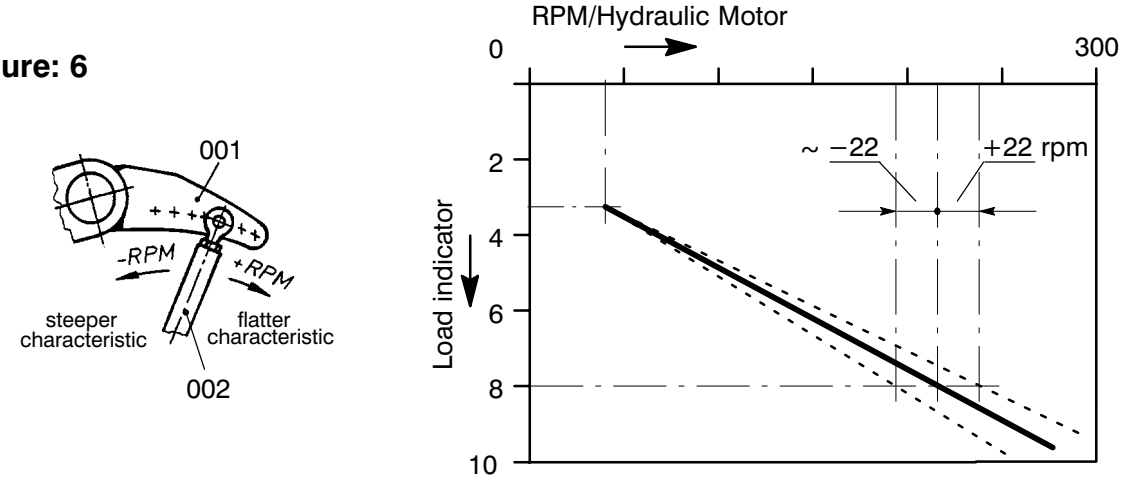
Figure: 5



4.4.3 Change of Hole Number

Hooking the connecting bar (002) into another hole in the setting lever (001) produces a gradient change of the characteristic line, corresponding to the characteristic lines 1.....7 in the NOMOGRAM.

Figure: 6



4.5 Setting the Minimum Admissible Hydraulic Motor Speed

After checking the correctness of the setting according to point 4.1, the final adjustment to the minimum hydraulic motor speed can be made as follows:

With the engine idling, limit the minimum admissible hydraulic motor speed by means of the stop screw (007) **to 50 rpm.**

4.6 Checking and Fixing the Basic Setting

4.6.1 Checking the Flexible Connection between the Regulating Linkage and the Flow Control Valve

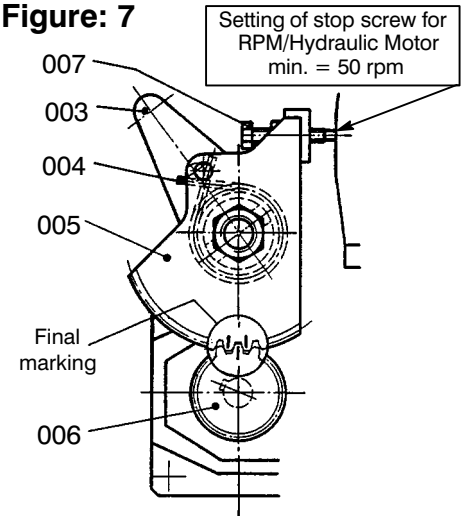
Bring the regulating linkage from load indicator position ”5” to position ”0” by means of the setting lever (001) and check whether in this region, the torsion spring (004) between the lever (003) and the toothed segment (005) is not additionally loaded.

4.6.2 Fixing the Basic Setting

Mark or secure (lock) the following items:

- Secure gear wheel (006) with locking plate.
- Mating of gear wheel (006) with toothed segment (005) in stop position, RPM/ Hydraulic Motor min. 50 rpm; remove provisional markings and mark final position (refer to Figure 7).
- Secure the stop screw (007) with lock nut and locking plate.
- Secure the connecting bar (002) at the adjusted length with two locking plates.
- Mark and record the established Hole No. on the setting lever (001), please refer to Figure 6.

Figure: 7



5. MODIFICATION TO THE BASIC SETTINGS

Principal rule:	**Never modify the basic setting without checking, with the aid of the NOMOGRAM, what influence it may have on the specific cylinder lubricating oil consumption.**

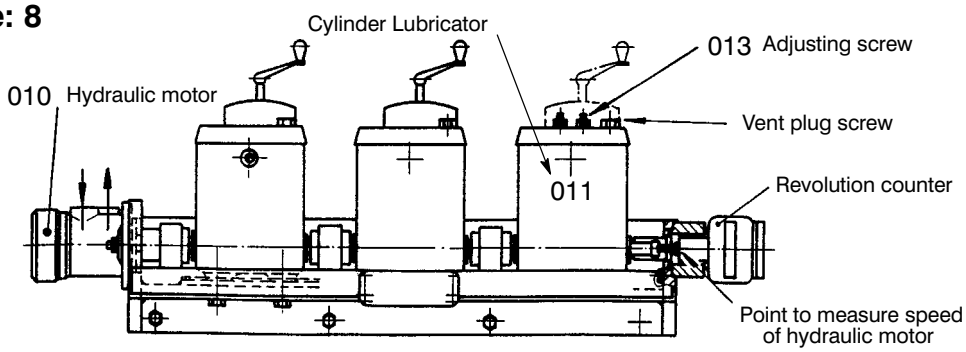
5.1 Modification to the Specific Cylinder Lubricating Oil Supply

Re−setting may become necessary after a longer operating period. It must also be possible to briefly increase the oil supply to the cylinder liners e.g. for running−in one or more cylinders, **without alteration to the other b a s i c settings.**

5.1.1 Modification to the Reduction Setting ”X” on Cylinder Lubricators

An adjustment to the setting ”X” on the cylinder lubricating apparatus (011) with the adjusting screw (013) shown in Figure 8 can be carried out individually on one or more cylinders, depending on the lubricating oil piping arrangement. Before adjustments are carried out, the original settings must be recorded. Adjustments on the set screws of the lubricators **changes the oil flow rate over the complete load range by a fixed percentage.**

Figure: 8



5.1.2 Shifting the Connecting Bar (002) into another Hole of the Setting Lever (001)

If the connecting bar is shifted into another hole of the setting lever (see Figure 6) the **specific oil flow for the whole engine is changed** upwards or downwards which ever the case may be.

5.2 Influence of Replacement Parts

5.2.1 Replacement of Flow Control Valve, Oil Pump or Hydraulic Motor

Should a flow control valve (008) or an oil pump (009), both shown in Figure 1, or a hydraulic motor (010), shown in Figure 8, have to be replaced, then the complete setting as described in paragraph 4 must be carried out.

5.2.2 Replacement of Cylinder Oil Lubricating Apparatus

In case of replacement of one or more cylinder oil lubricators (011) shown in Figure 8, it is understood that the replacement unit is of the same make and type.

If this is the case, then only the recorded reduction "X" must be carried out on the adjusting screws (013) of the lubricating apparatus (refer to enclosures RTA−23 / 1 / 2 / 3).

6. PRACTICAL ADJUSTMENT OF LUBRICATING OIL FEED RATE

(please refer to graph on enclosure RTA−23 / 4B)

By following the instructions in the "Running−in Guidelines" during running−in of individual cylinder liners or piston rings after overhauls, a specific cylinder lubricating oil feed rate of around 1.6 g/kWh, based on the CMCR (Contracted Maximum Continuous Rating), should be arrived at (see enclosures RTA−23 / 4A and 4B). The actual value will of course depend upon such factors as the sulphur content of the fuel, see also section 041 of the Instruction Manual.

As can be seen from the "Running−in Guidelines" a running-in cylinder lubricating oil type **SAE 50 / TBN 10−20 / API CD** or equivalent is recommended for the initial running−in period at the maximum feed rate (approx. 2.5 g/kWh). A **straight mineral oil SAE 50 / TBN 0 should not be used for running-in at higher than approx. 60% MCR.**

The feed rate may be reduced successively over the next 1000 hours as shown on the graph. Any further reduction to the cylinder lube oil feed rate may depend upon the service rating and the condition of the running gear with regard to wear rates.

The above feed rate reductions are carried out by means of the adjusting screws on the cylinder lubricators only. No adjustment would normally be made to the basic setting of the lubricator drive system.

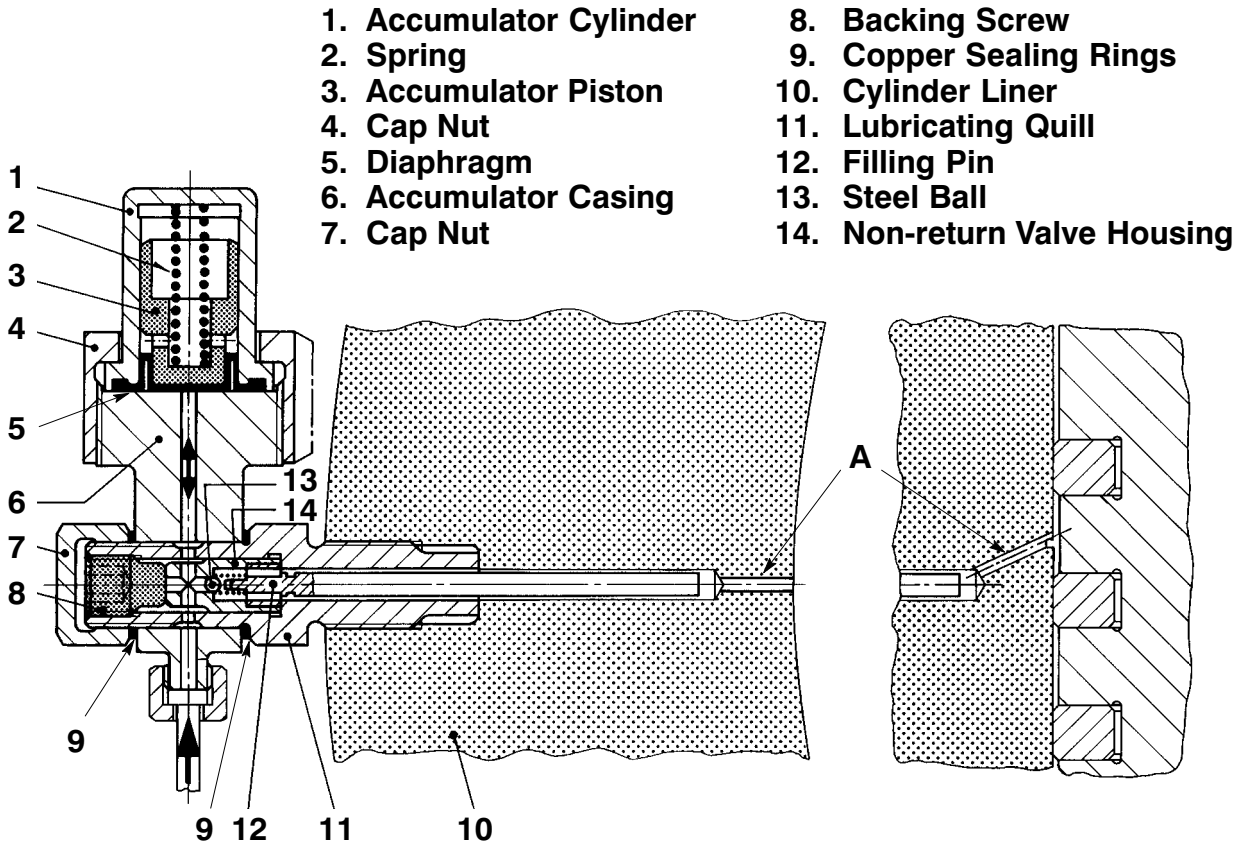
For low service ratings compared to CMCR, as well as in the event of a high proportion of continuous low−load running, we recommend a reduction in the specific cylinder lube oil consumption to 1.0 g/kWh based on the service rating, provided that acceptable wear rates have been obtained up to this point. Regular checking of the piston rings (running−in behaviour) through the liner ports is absolutely necessary during the duration of any specific lube oil feed rate reduction.

7. CYLINDER LUBRICATING QUILLS WITH ACCUMULATOR

Recently there were reports that the backing screw (please refer to Item 8 on the sketch below) was found loose on several cylinder liner lubricating quills.

As a direct consequence the following damage has occurred:

- Due to the fact that the sealing surface of the non-return valve was not tight anymore, hot gases from the combustion chamber could reach the diaphragm (Item 5) and piston (Item 3), causing their destruction.
  As a consequence, the ring gap between filling pin (Item 12) and bore in the cylinder liner (Item 10) was blocked by carbonized cylinder lubricating oil.
- In some cases, the filling pin (Item 12) cracked at the landing of the non-return valve (Item 14). The axial movement of the broken-off filling pin then caused a crushing and consequently a blocking of the small inclined bore (A) which leads to the running surface of the cylinder liner.



The failure of the lubricating oil quills has resulted in the following secondary damage to the engine:

- Extreme piston ring wear and therefore an increased blow-by of combustion gases into the piston underside space.
- Severe cylinder liner wear.
- Crack formation at the outlet bores of the cylinder lubricating oil grooves due to a more intensive gas exchange because of the malfunctioning non-return valves.

Based on the above findings, we recommend the following measure to be carried-out on your engine at the earliest convenience:

- All lubricating oil quills fitted to the engine should be dismantled, the components are to be checked thoroughly and replaced if necessary.
- The thread on the backing screw (Item 8) and the quill housing (Item 11) has to be degreased and then lightly coated with LOCTITE 648. Care must be taken that no LOCTITE is entering the non-return valve housing as this could prevent the proper functioning of the non-return valve.
- **The backing screw should then be tightened properly and finally secured with a centre punch mark.**

8. SERVICE BULLETINS PUBLISHED FOR RTA 38 AND RTA 48 ENGINES

Please note that for RTA 38 and RTA 48 engines we have so far published the following Service Bulletins:

RTA–5 dated 23.05.90 / Toggle Joint: Piston Cooling Oil / Crosshead Lubrication Oil Connection Linkage

RTA–6 dated 12.09.90 / Recommendations Concerning Piston Running Behaviour

RTA–7 dated 27.05.92 / Actuator Cam for Exhaust Valve Drive

RTA–12 dated 11.11.92 / New Piston Rod Gland Box / Undersized Piston Rods

RTA–13 dated 07.06.93 / Fuel Injection Nozzles 2P–Nozzle Design

RTA–14 dated 30.11.93 / System Oil Care and Maintenance

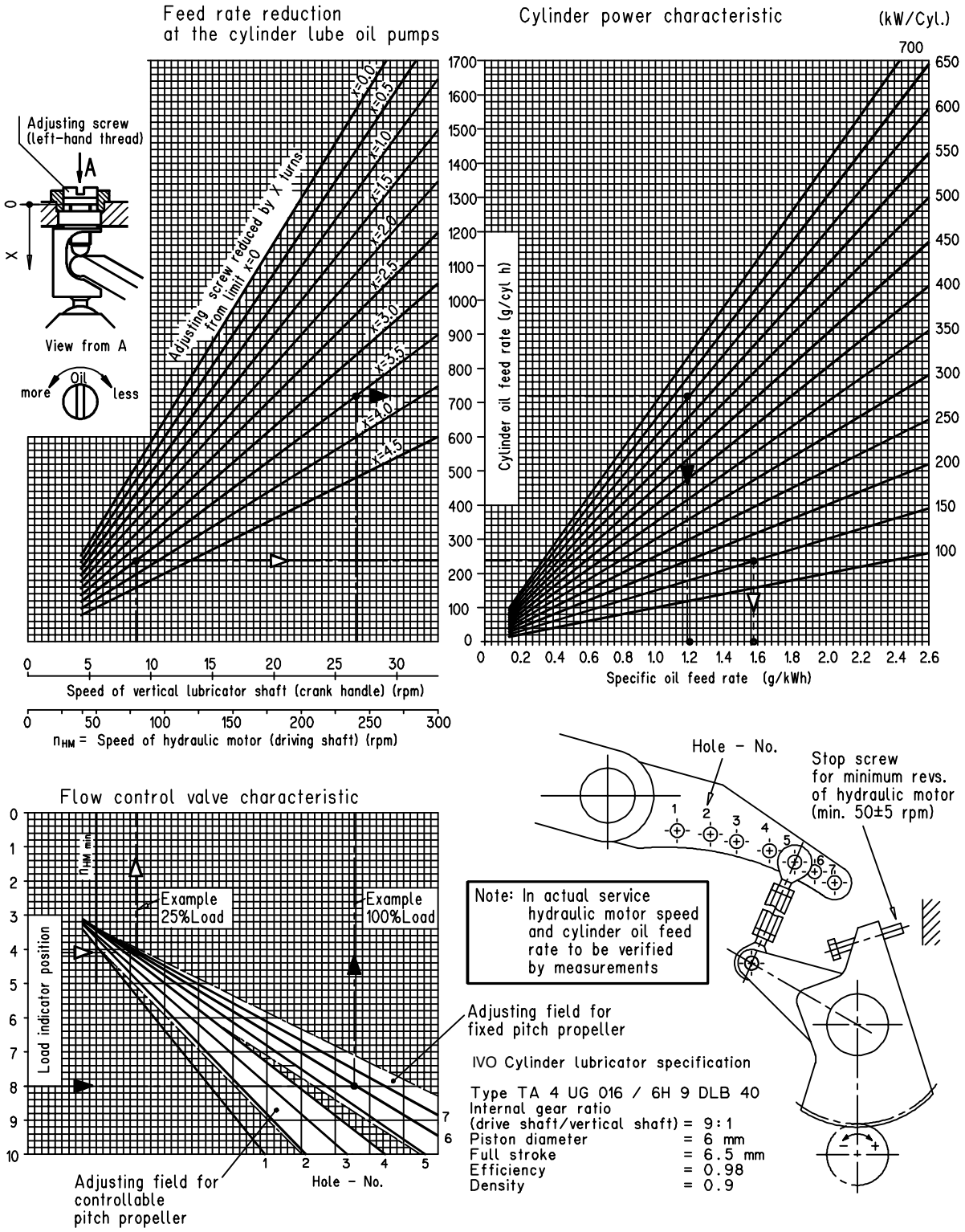
RTA–18 dated 15.09.94 / Running-in of Piston Rings and Cylinder Liners

Should you not be in possession of the above mentioned documentation kindly contact your local New Sulzer Diesel representative for your copy.

ENCLOSURES: as mentioned in the text

Lubrication o Cylinder Liners R A 38

Nomogram is suitable or all types o engine control e cept C 38



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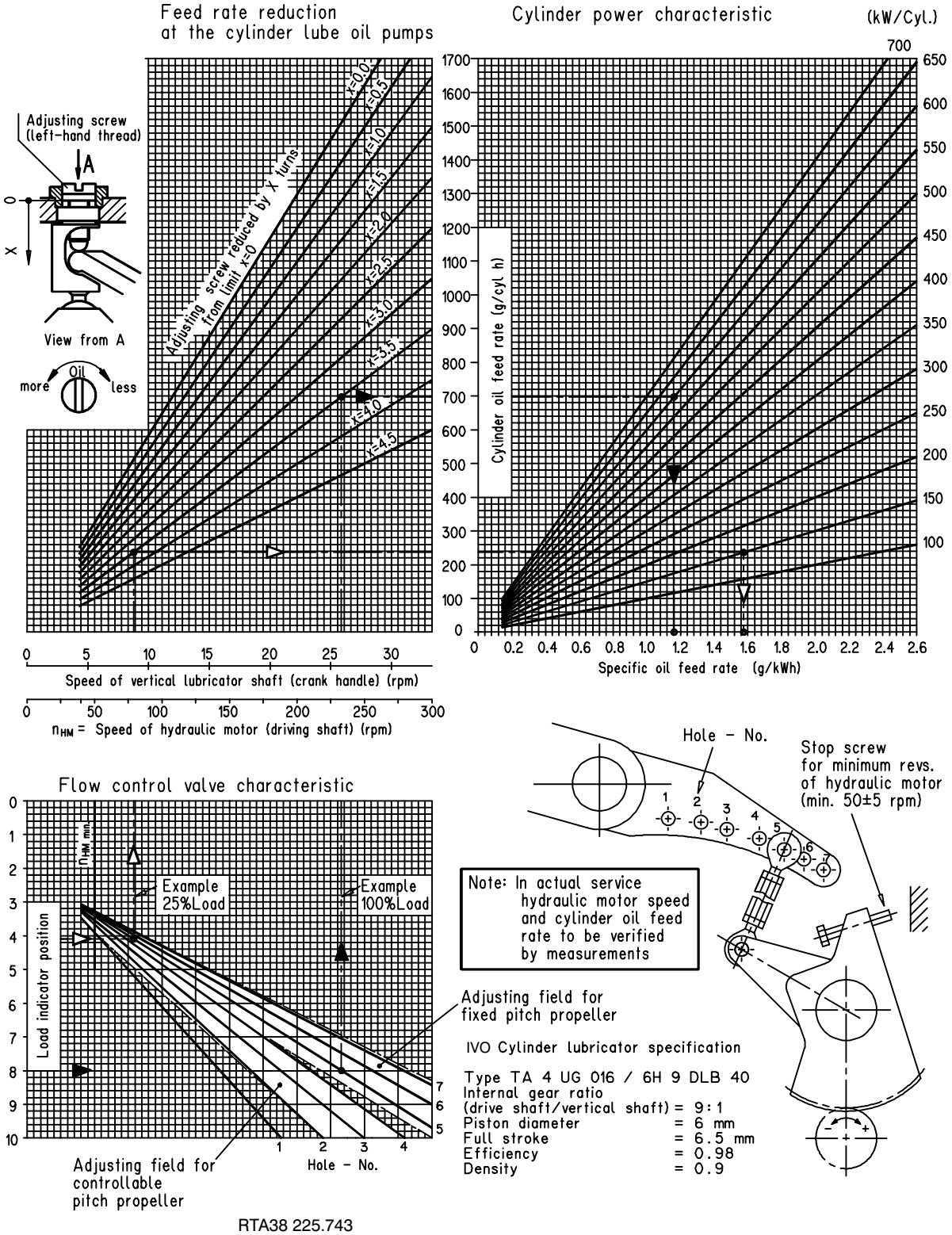
Lubrication o Cylinder Liners R A 38

Nomogram is suitable or C 38 only



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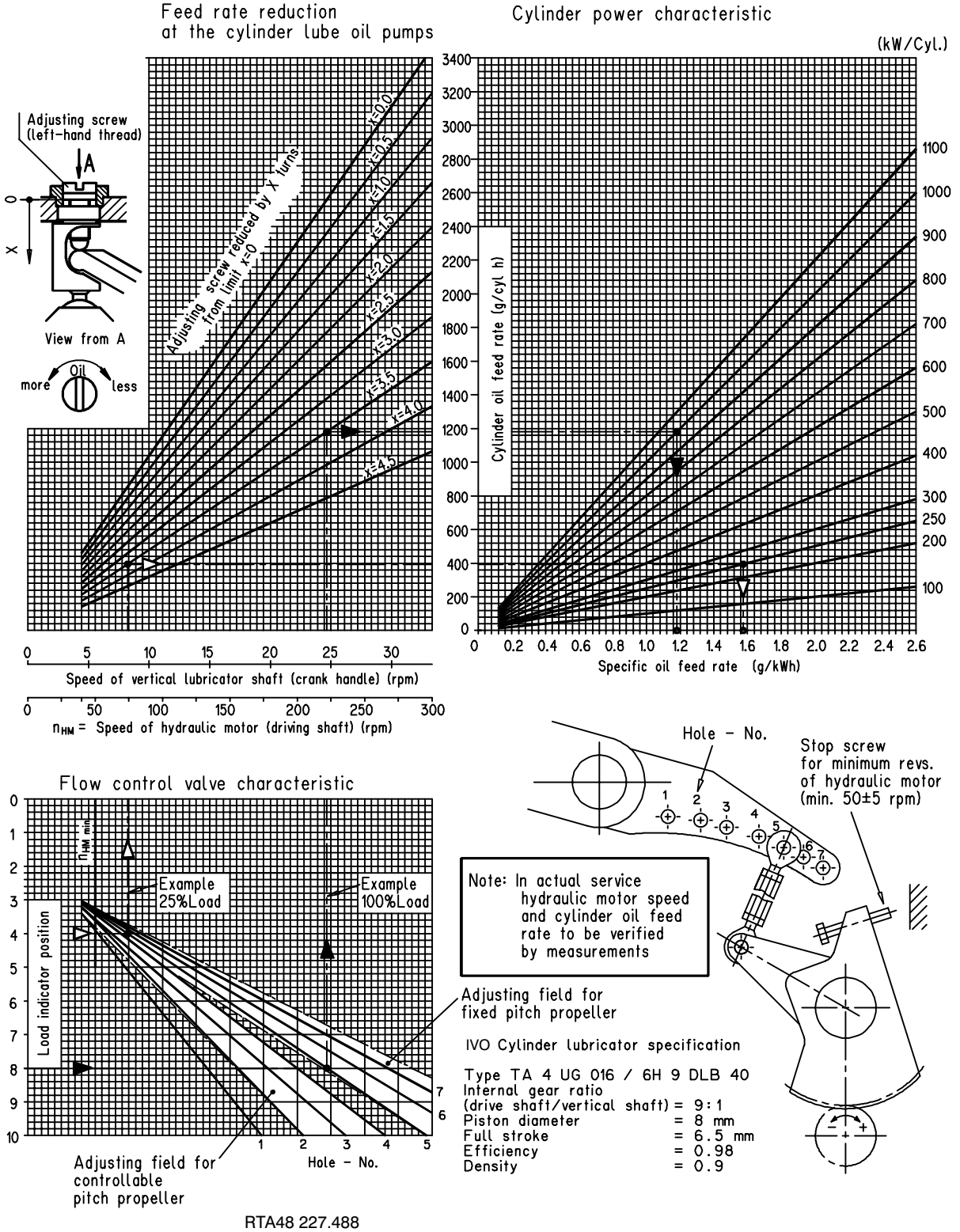
Lubrication o Cylinder Liners R A 48

Nomogram is suitable or all types o engine control



RTA48 227.488

RUNNING-IN GUIDE LINES FOR RTA TYPE ENGINES

This pamphlet informs you about the running-in procedure of newly fitted piston rings after a piston overhaul and / or replacement of one or more cylinder liners on an engine in service.

These running-in guidelines are based on our experience with material (cylinder liners and piston rings) approved by **New Sul er Diesel Ltd.**

1. RUNNING-IN OF NEW CYLINDER LINERS AND PISTON RINGS

(please also refer to the Running-in Guidelines RTA−23 / 4B shown overleaf)

1.1. Checks to be Carried out before Starting the Engine:

- Check condition of piston rings and cylinder liners from piston underside (if engine has not been started for some time, also look to see if there are any signs of condensation or leakages).
- Check scavenge air receiver for contamination (dirt from welding, sand blasting etc.), especially on new buildings and after a docking.
- Check that water separator is properly installed with no by-passes.
- Check that receiver drains are open and that the high level alarm functions properly.
- Pre-heat engine to minimum 60•C jacket cooling water temperature.
- Pre-lubricate cylinders by turning the engine over with the turning gear for at least 5 complete revolutions whilst operating the cylinder lubricators.
- Check if the cylinder lubricator settings are set to maximum (approximately 1.8 g/BHPh).

1.2. Remarks on Running-in

- If possible, start the engine on HFO (Heavy Fuel Oil), which is correctly separated and properly preheated.
- If it is for some reason not possible to start the engine on HFO, it is highly recommended to change over to HFO as soon as the required pre-heat temperature is reached which should be **b e f o r e** the engine reaches a load of **60% CMCR** (Contract Maximum Continuous Rating).
- The load up programme should not be faster than shown on the Running-in Guidelines overleaf.
- The stability and the level of the cylinder cooling water temperature must be checked frequently (no fluctuations in temperature must take place).
- Liner Wall Temperature Monitoring is of great advantage during running-in.
- During running-in of new cylinder liners it is also recommended to mechanically limit the fuel rack position to the momentarily required load position (for example 60%) in order not to overload the newly fitted cylinder liners due to heavy rudder commands and / or excessively fast load up commands.
- It is necessary to occasionally inspect the condition of the running surfaces of the piston rings and the cylinder liner to assess the status of running-in.
- The cylinder oil type **SAE 50 / TBN 10−20 / API CD** or equivalent, recommended for running-in may not always be readily available from all the oil suppliers. It is recommended, therefore, to contact the oil supplier well in advance and allow for some extra days for the delivery.

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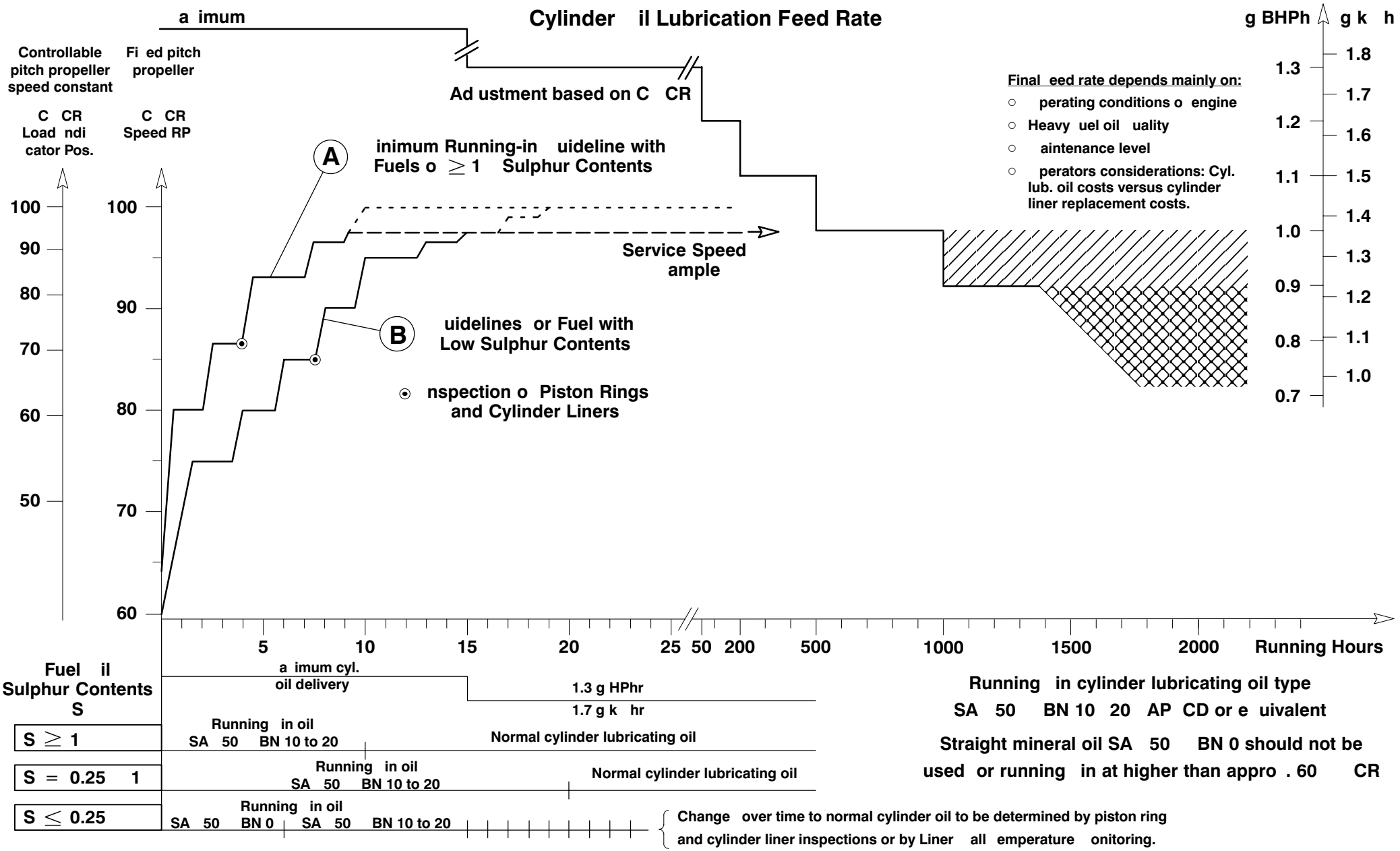

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