



# Lubricants Report



## Product Data Sheet from Shell Lubricants

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# SHELL TELLUS\* OILS S

## ZINC-FREE HYDRAULIC OILS FOR SEVERE DUTY

Shell **Tellus Oils S** are 'top-tier', anti-wear hydraulic oils formulated to be the ultimate 'high reference oil' in the hydraulics industry. Based on advanced 'zinc and chlorine free' technology, Shell **Tellus Oils S** are formulated to ensure exceptional performance in hydraulic fluid power transmission systems subjected to severe duty.

### APPLICATIONS

Primary application in industrial, marine and mobile hydraulic and fluid power transmission systems.

### PERFORMANCE BENEFITS

- **Outstanding oil life**  
Typically two to four times that of many anti-wear hydraulic oils.
- **Peace of mind**  
Through longer component life and trouble free operation.
- **Lower ecological impact**  
Zinc and chlorine free formulations unique to Shell.
- **Long life**  
The length of a hydraulic oil's life depends mainly on its ability to resist oxidation due to heat in the presence of air, water and metal catalysts such as copper. Oxidation results in the formation of sludge and acidic products. A standard test of oxidation properties is the Turbine Oil Stability Test (TOST), in which the oil is heated at 95°C in the presence of water and oxygen with copper and iron as catalysts. The test results are expressed as time taken (hours) for the acid value to reach 2 mg KOH/g. In this test, Shell **Tellus Oils S** have an oxidation life of two to four times that of many other anti-wear hydraulic oils.
- **Vane pump wear performance**  
Shell Tellus Oils S have been subjected to a number of vane pump tests which are some of the most severe for evaluating steel-on-steel anti-wear properties. Excellent performance has been achieved in the standard industry tests using Vickers (V104C and 35VQ25M) and Denison (T6-C) hydraulic vane pumps. In addition, outstanding performance is also observed when applying Shell in-house test conditions. These test the fluids over the complete range of pump operating conditions. The results have proven that Shell Tellus Oils S are capable of providing the ultimate protection under the extremes of operation found in real service.
- **Thermal stability**  
An oil's thermal stability is the measure of its ability to resist degradation and attack of metals at high temperature. An accelerated test for this is to maintain the oil at a temperature of 135°C for one week in the presence of steel and copper. Tests with Shell Tellus Oils S show negligible weight changes of the metals, whilst the steel remains bright and there is only slight discolouration of the copper; many anti-wear hydraulic oils cause the copper to become black.
- **FZG gear rig test**  
Gear rig tests are sometimes used for evaluating hydraulic oils and the best known is the FZG rig (Forschungsstelle für Zahnräder und Getriebbau - Technical Institute for the study of Gears and Drive Mechanisms). The rig utilises a pair of specially designed casehardened spur gears and, for hydraulic oils, it is run at a pitch line velocity of 8.3 m/s, with an oil temperature of 90°C. The test is carried out by running the gears for 15 minutes in the test oil then weighing the gears, after which the machine is reassembled and the load increased. This procedure is carried out until at least 10 mg weight loss is recorded between the stages, or until the gears appear scuffed. Tellus S achieves an 11th Fail stage.

- **Piston pump performance**

Many piston pumps utilise brass components and in particular brass slippers which fit onto the heads of steel pistons and slide on a steel surface. These bronze slippers are usually the items of wear and an oil's performance is normally evaluated by the weight loss of bronze and the loosening of the fit on the pistons, referred to as "slipper fit". Many anti-wear hydraulic oils permit either considerable wear, if the pumps are highly loaded, or in extreme cases result in pump failure by the slippers detaching themselves from the pistons. Shell Tellus Oils S give extremely low wear rates of the brass components in the Denison P-46 pump; the most severe standard industry test for this performance aspect.

- **Hydrolytic stability**

Hydrolytic stability indicates the extent to which oil tends to develop acidity in the presence of copper and water at high temperatures. The test for hydrolytic stability not only evaluates the acidity developed by the oil, but also any acidity developed in the water present, and is also regarded as giving an indication of an oil's suitability for use with copper alloy parts. It is a stringent test in which many good anti-wear hydraulic oils perform poorly, but in which Shell Tellus Oils S give outstanding results. In the hydrolytic stability test, oil, water and copper are sealed in a bottle and rotated for 48 hours in an oven at 93°C. At the end of the test, the oil and water layers are separated and the insolubles weighed. The change in weight of the copper is also measured and the viscosity and acid numbers of both the oil and the water are determined. Results of the tests with Shell Tellus Oils S are excellent. They show negligible copper weight loss and very small changes in acid values of oil and water.

- **Water separation**

The small quantities of water that can enter a hydraulic system through condensation (caused by breathing) can form highly viscous water-in-oil emulsions that may damage valves and pumps. As the temperature of many industrial hydraulic systems is too low to evaporate this water, it is essential that the hydraulic oils should have good water separation properties (demulsibility). A standard test for demulsibility is the ASTM D-1401. In this test, an equal mixture of oil and water is stirred for five minutes and the time required for the separation of the emulsion is recorded. Shell Tellus Oils S separate extremely rapidly from water in this test.

- **Corrosion resistance**

The corrosion resistances of Shell Tellus Oils S have been tested using in-house as well as in the widely used rust test IP 135 and copper corrosion test IP 154. Excellent performance has been proven involving such metals as silver, copper, phosphor bronze, aluminium bronze, brass, magnesium, aluminium, zinc, cadmium-plated steel and steel. Shell Tellus Oils S show a marked improvement with regard to phosphor bronze and silver over conventional anti-wear hydraulic oils in general.

- **Air release and anti-foam properties**

Shell Tellus Oils S are free from excessive foaming tendencies and are capable of releasing air readily in order to avoid cavitation effects and increased compressibility. The performance of Shell Tellus Oils S in these tests is outstanding - even under the most severe conditions.

- **Filterability**

Hydraulic oil can cause filter blocking by deposits formed through contamination including water etc. Tests show that Shell Tellus Oils S have excellent filterability, even when contaminated with water and other system degradation materials.

- **Oil seal and paint compatibility**

The compatibility of oil with seals used in hydraulic systems can be evaluated by numerous tests usually relating to the 'swell' characteristics. The properties of the base oil mainly influence oil seal and paint compatibility, whilst additives have little affect. Shell **Tellus Oils S** are compatible with all seal materials and paints normally specified for use with mineral oils.

- **Specification and Approvals**

Tellus S have been tested and approved to exceed the following industry requirements:

Denison HF-0

Rexroth

Vickers M-2950-S (Mobile systems)

I-286-S (Industrial systems)

Cincinnati Milacron P68, P69, P70

ISO 11158

## HEALTH AND SAFETY

Shell Tellus Oils S is unlikely to present any significant health or safety hazard when properly used in the recommended application, and good standards of industrial and personal hygiene are maintained. Avoid contact with skin. Use

impervious gloves with used oil. After skin contact, wash immediately with soap and water. For further guidance on Product Health & Safety refer to the appropriate Shell Product Safety Data Sheet.

## PROTECT THE ENVIRONMENT

Protect the environment Take used oil to an authorised collection point. Do not discharge into drains, soil or water.

## ADVICE

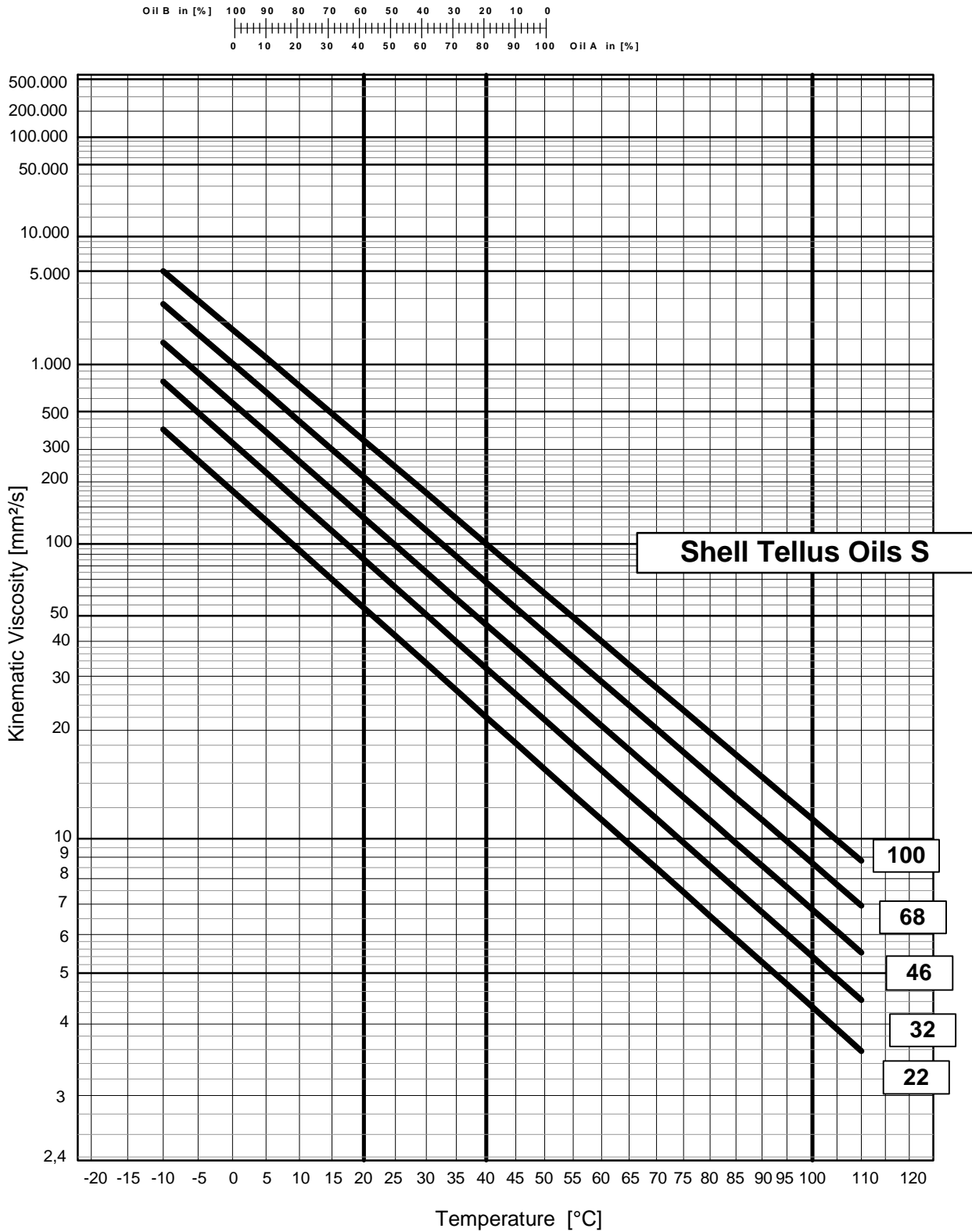
Advice on applications not covered in this leaflet may be obtained from your Shell Representative.

## TYPICAL PROPERTIES

<b>Shell Tellus Oil</b>		<b>S 46</b>
<b>Viscosity Grade</b> (ISO 3448)		46
<b>ISO Oil Type</b>		HM
<b>Kinematic Viscosity</b>		
@ 0°C	cSt	576
20°C	cSt	135
40°C	cSt	46
100°C	cSt	6.8
(IP 71)		
<b>Viscosity Index</b> (IP 226)		98
<b>Density @ 15°C</b> (IP 365)	kg/l	0.876
<b>Flash Point</b> (IP 34) (PMCC)	°C	218
<b>Pour Point</b> (IP 15)	°C	-30

The physical characteristics shown are typical of current production. Whilst future production will conform to Shell's specification, variations in these characteristics may occur.

# Viscosity - Temperature - Diagram



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