



Product & Technical Data

Castrol Transaqua EE1

Water-based subsea production control fluid

Description

Castrol Transaqua EE1 is a water-based hydraulic control fluid specifically formulated for use as the control medium in subsea and surface production control systems. The fluid incorporates all the features that are required for operation in a wide range of equipment, and can therefore be used as the operating medium throughout the control system, eliminating the need for the need for separate fluids for the general and high temperature (subsurface safety valve control) areas.

CE² (Continuous Environmental Enhancement) Programme

The Castrol Subsea Technology CE² programme is about Continuous Environmental Enhancement. The primary purpose is to assure continued availability of subsea control fluids that meet and exceed all environmental and technical requirements as these requirements evolve. The programme is based on an evolutionary approach to product development, with the objective of building on the performance of each subsequent product release. The approach ensures that previous track record is retained and avoids unpredictable changes in control fluid technology and consequential impact on system performance and reliability.

- Castrol Transaqua EE1 provides demonstrable environmental improvements according to SFT criteria.
- Castrol Transaqua EE1 has been evaluated and has identical performance characteristics to Castrol Transaqua HT.
- Castrol Transaqua EE1 has also been evaluated as being fully compatible with Castrol Transaqua HT.
- Castrol Transaqua EE1 is therefore recommended for installation in:
New subsea production control systems
Existing systems using Castrol Transaqua HT

Castrol Transaqua EE1 has been developed and qualified under a system with ISO 9001 accreditation for Research and Development.



Application

Castrol Transaqua EE1 is designed specifically for use in all conventional and high pressure, high temperature applications. Castrol Transaqua EE1 is tolerant of the high well temperatures encountered by those parts of the control system located at the well bore. Castrol Transaqua EE1 is rated for use at operating temperatures of up to 180°C. The glycol content also allows use in areas where low ambient temperatures prevail.

Features

- Operating capability of 180°C
- Corrosion protection with sea water contamination
- Anti-wear properties
- Exceeds cleanliness standard of NAS 1638 Class 6
- Contains unique tracer to aid low level leak detection
- Castrol Transaqua EE1 is fully compatible and miscible in all proportions with Castrol Transaqua HT and most other water-based subsea control fluids.
- It is compatible with all metals used in subsea control systems, and with elastomers and plastics including Nitrile, Ethylene Propylene and PTFE.

Benefits

- Allows reliable operation of subsea equipment exposed to conventional or HP/HT conditions.
- Allows rapid detection of leaks with ROV mountable Castrol Transaquatracka – leak detection tool.



Castrol Transaqua EE1 – Typical Physical Characteristics

Relative Density	
@ 20°C	1.065
@ 50°C	1.047
Pour Point, °C	-36
Flash Point, °C	Not applicable
Viscosity, cst	Typical values
@ 40°C	1.97
@ 20°C	3.59
@ 0°C	7.48
PH @ 20°C	8.9
Bulk Modulus, N/m ²	2.31 x 10 ⁹
Coefficient of Thermal Expansion, /°C	0.00057
Thermal Conductivity, W/m/°C	0.42
Specific Heat, KJ/Kg/K	3.257
Foam Test Sequence, ml	
Sequence I	110/0
Particulate Cleanliness	
NAS 1638	Class 6 or better
ISO 4406	Code 14/11 or better

Castrol Transaqua EE1 – Typical Performance Characteristics

Property	Performance
Sea water stability	Stable to 10% sea water contamination Provides anti corrosion performance on carbon steel with 10% sea water
Microbiological growth – 28 day challenge test Fungi Bacteria	Sterile during and after test
Lubrication Shell 4 Ball Mean Wear Scar Diameter (1hr, 30 kg, 1460 rpm)	0.908mm
Environmental performance	All toxicity, biodegradation and bioaccumulation testing completed within OSPAR guidelines. Registered on CHEMS in Norway.

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Castrol Transaqua EE1 – Metal compatibility

Material	Compatibility	Comments
Plain Carbon Steel	Compatible	Unprotected carbon steel above the fluid surface may be subject to corrosion from condensed moisture if fluid contains excessive water.
Stainless Steel (316L)	Compatible	
Steel 1020	Compatible	
Super Duplex Steel (2507)	Compatible	
Inconel (Incoloy 825)	Compatible	High temperature applications
Hastelloy	Compatible	
Titanium	Compatible	
Aluminium Bronze	Compatible	
Phosphor Bronze	Compatible	
Chromium Plating	Compatible (see comments)	Plating thickness must be sufficient to avoid porosity. Copper and nickel substrates can improve performance.
Nickel 200	Compatible	
Electroless Nickel Plating	Compatible (see comments)	Ensure even plating thickness
Aluminium	Limited Compatibility	Components may be protected by hard-anodising. Avoid rubbing contacts.
Cadmium Plating	Not Compatible	Often used on standard industrial hydraulic fittings
Zinc Plating	Not Compatible	Effect is largely cosmetic (soft deposits on surface) but system cleanliness can be adversely affected

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Castrol Transaqua EE1 – Elastomer & Plastic compatibility

Material	Compatibility	Comments
Medium Nitrile	Compatible	Widely used as standard seal material. Performance can vary according to grade
Carboxylated Nitrile	Compatible	Excellent abrasion resistance
Viton	Compatible	Performance can vary according to grade. Superior to nitrile if higher temperatures involved (90°C or above)
Butyl	Compatible	
Polyurethane	Compatible (see comments)	Avoid use in areas of hydraulic system operating at temperatures above 60°C (some grades have improved hydrolytic stability and are therefore suitable – consult seal supplier)
Ethylene Propylene	Compatible	Important if changing fluid type - EPR is not suitable for use with any hydrocarbon based fluids
Silicone	Compatible	
Chemraz	Compatible	Excellent for high temperature applications
Acetal	Compatible	
PTFE	Compatible	
Nylon	Compatible	See separate compatibility data for Nylon 11 thermoplastic as umbilical hose liner material
Rubber Impregnated Fabric Composites	Not Compatible (unless specifically developed for water service)	Wear exposes fabric, allowing moisture ingress and swell/delamination. Replace with polymeric seal compound

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Castrol Transaqua EE1 – Elastomer & Plastic compatibility data

All compatibility testing is carried out to ASTM D471.

Elastomers

Material	Temperature, °C	Duration, weeks	% Volume Change	% Thickness Change	% Hardness Change (Shore D)
Viton	40	12	0.7	0.3	- 3.3
Viton	70	12	1.0	0.9	0
NBR	40	12	4.1	1.1	- 7.2
NBR	70	12	5.4	1.7	-1.4
HNBR	40	12	1.7	0.3	-4.6
HNBR	70	12	1.8	0.6	-3.1
HNBR	120	12	4.1	1.2	3.2

Thermoplastic

Material	Temperature, °C	Duration, weeks	% Volume Change	% Thickness Change	% Hardness Change (Shore A)
PTFE	120	12	1.0	0	-2.1
PTFE	150	12	1.9	0	0
PEEK	120	12	0.6	0	2.2
PEEK	150	12	1.3	-1.7	3.2

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Health and Safety

The wearing of impervious PVC (or other suitable material) apron and gloves, together with eye protection is recommended. Contaminated clothing should be changed immediately and thoroughly cleansed before re-use. This applies especially to under garments.

Material safety data sheets are available for all Castrol subsea products from www.castroloffshore.com

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