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Hydraulic Fluids and Lubricants
Technical Information
Fire Resistant Hydraulic Fluids

FIRE RESISTANT HYDRAULIC FLUIDS ACCORDING TO DIN 24 317, DIN 24320, VDMA 24 317, AND ISO 12 922

HFA fluids – oil-in-water emulsions according to DIN 24 320 and ISO 12 922.

There can be bacterial control problems and corrosion problems. Fluid pH stability can be a problem and can cause wear and chemical reaction with aluminium. Also, there may be a solvent action on some paints.
A positive head reservoir is required to maintain a positive inlet pressure when operating, and to keep air out of internal passageways when shut down.

HFA fluids are divided into two groups:

- **HFAE** fluids are Oil-in-Water emulsions with low emulsion oil content according to DIN 24 320 and ISO 12 922. Normally these fluids contain 1 to 5 % emulsion oil related to the volume.
- **HFAS** fluids are solutions with typically not more than 10 % fluid concentrate in water according to ISO 12 922.

HFB fluids–water-in-oil emulsions according to VDMA 24 317 and ISO 12 922.

These fluids can break down with repeated freezing and thawing. Also, heating above **60°C [140°F]** can cause emulsion breakdown. High specific gravity requires an elevated reservoir and increased inlet line size. Monitoring of fluid water content is necessary. Frequent additions may be necessary in order to overcome evaporation losses. These fluids also show poor vapor phase corrosion inhibition.

HFC fluids – watery polymer solutions or water glycols according to VDMA 24 317 and ISO 12 922.

They attack zinc and cadmium, and produces solvent action on some paints. For more information contact the fluid manufacturer. Wear of aluminum in transmission parts sometimes occurs in the presence of these fluids. Viton seals are not recommended. High specific gravity requires an elevated reservoir and increased inlet line size. Water content and pH-number may be a problem.

HFD fluids – water free, synthetic fluids according to VDMA 24 317 and ISO 12 922.

Viton seals are required. Consult the fluid manufacturer to obtain a recommendation of the particular fluid used. These fluids attack some plastics, zinc and cadmium. High specific gravity requires an elevated reservoir and increased inlet line size.

Some of these fluids have caused high wear of aluminum parts in transmissions.

HFD fluids are divided into four groups: **HFDR**, **HFDS**, **HFDT**, and **HFDU**.

- **HFDR**: Fluid based on Phosphorus acid Ester according to DIN 24 317 and ISO 12 922. Used primarily in Great Britain in the mining industry.

- **HFDS**: Fluid based on Chlorinated Hydrocarbons according to DIN 24 317.
  Used primarily in hydrodynamic clutches.

- HFDT: Fluid based on mixtures of Phosphorus acid Ester and Chlorinated Hydrocarbons according to DIN 24 317. Used primarily in hydrostatic transmissions.

- **HFDU**: Other synthetic hydraulic fluids without water according to DIN 24 317 and ISO 12 922. Used primarily in aviation hydrostatic.

Fluid conversion

Consult VDMA 24 314, ISO 7745 and the fluid manufacturer guidelines when converting to another hydraulic fluid.

Use caution when converting an application to a different fluid. Thoroughly test the new fluid in the application before committing to the change.

REQUIREMENTS FOR FIRE RESISTANT HYDRAULIC FLUIDS

Orbital Motors Type MM

		Type			
		HFA	**HFB**	**HFC**	**HFD**
Standard		ISO 12922 DIN 24320	ISO 12 922 VDMA 24 317		
Features		Oil in water emultion	Oil in water emultion	Watery polymer solution	Water free synthetic fluids
Max. differential pressure bar	cont.	50	70		
	int.	70	100		
Operating temperature[1]	°C	5 - 55	5 - 60	-20 - 60	10 - 70
Water content[1]	%	>80	>40	>35	-
Typical roller bearing life (mineral based fluid is 100%)		<5	30 - 35	10 - 20	50 - 100
Estimated life time (mineral based fluid is 100%)		2 – 5 %	10-20 %	10-15 %	80-100 %

[1] The temperature range and the water content are based on the specific fluid properties.

The above mentioned recommendations for maximum temperature limits are a guideline for most applications.

Fire resistant fluids may be used, but much lower lifetime, compared to mineral oil, may be expected.
Low viscosity and high pressure may increase the internal leakage. Increasing internal leakage may cause erosion because of the higher fluid velocity. The wear caused by erosion is worsened if the fluid is contaminated.

The density and steam pressure for fire resistant fluids are different from mineral oils, and this may increase the risk of cavitation. Also the pressure drop is different, and this may influence the dynamics and stability of the valve. Therefore it is recommended to minimize pressure drop and keep working temperatures low.