

Mineral-oil-based hydraulic fluids.
Minimum technical requirements.

Linde Hydraulics

Linde

1. Area of application and purpose.

This standard contains the minimum technical requirements for mineral-oil-based hydraulic fluids in accordance with DIN 51524 Part 2, Part 3 and Linde-specific requirements. It serves as a selection aid in development and in the decision-making process for the approval of hydraulic oils that are not recognised as reference oils.

Comment: For the purpose of this standard, reference oils are hydraulic oils that have been used in the testing and production-approval process for Linde products (e.g. HLP68 — Esso Nuto H68).

2. Terms.

Definition in accordance with DIN 51524 Part 2 and Part 3

HLP hydraulic oil

Hydraulic fluid made from mineral oils with agents to increase corrosion protection, enhance resistance to aging and reduce scoring in areas of mixed friction.

HVLP hydraulic oil

Hydraulic fluid made from mineral oils with agents to increase corrosion protection, enhance resistance to aging, reduce scoring in areas of mixed friction and improve viscosity-temperature characteristics.

Code for hydraulic oil in accordance with DIN 51502:1990-08 or DIN EN ISO 6743-4:2002-04

Examples: HLP 46 in accordance with DIN 51502 / HM 46 in accordance with DIN EN ISO 6743-4

3. Requirements and testing.

See table below.

Characteristics and units	Testing procedure	Thresholds												NB	
		In accordance with DIN 51524-2						In accordance with DIN 51524-3							
		HLP 22	HLP 32	HLP 46	HLP 68	HLP 100	HLP 22	HVLP 32	HVLP 46	HVLP 68	HVLP 100				
Viscosity grade ISO VG	DIN 51519	22	32	46	68	100	22	32	46	68	100				
Density at 15°C (kg/m ³)	DIN 51757														
Kinematic viscosity (mm ² /s) -20°C															
Kinematic viscosity (mm ² /s) 0°C max.	DIN 51562-1	300	420	760	1400	2560									
Kinematic viscosity (mm ² /s) 40°C min./max.		19.8/24.8	28.8/35.2	41.4/50.6	61.2/74.8	90/110	19.8/24.8	28.8/35.2	41.4/50.6	61.2/74.8	90/110				
Kinematic viscosity (mm ² /s) 100°C min.		4.1	5	6.1	7.8	9.9									
Viscosity index "VI" (min.)	DIN ISO 2909														
Pour point, equal to or below (°C)	DIN ISO 3016	-21	-18	-15	-12	-12	-39	-30	-27	-24	-21				
Flashpoint higher than (°C)	DIN EN ISO 2592	165	175	185	195	205	175	175	180	180	190				
Cleanliness level	ISO 4406														
Solid foreign matter content (mg/kg) max.	DIN ISO 5884 or ISO 4405			50					50						
Water content max. (%)	DIN EN ISO 12937			0.05					0.05						
Filterability dry (w/o H ₂ O) stage I/F ₁ /stage II F ₁₁ min. %	E DIN ISO 13357-2			60/80					60/80						
Filterability wet (with H ₂ O) stage I F ₁ /stage II F ₁₁ min. %	E DIN ISO 13357-1			50/70					50/70						
Foaming characteristics (ml) at 24°C max.				150/0					150/0						
Foaming characteristics (ml) at 93.5°C max.	ISO 6247			75/0					75/0						
Foaming characteristics (ml) at 24°C after 95°C max.				150/0					150/0						
Air-release capability in min at 50°C max.	DIN ISO 9120	5	5	10	13	21	5	5	13	13	21				
Neutralisation value (mg KOH/g)	DIN 51558														
Aging characteristics — increase in neutralisation value after 1000 hrs, mg KOH/g	DIN 51587 or DIN EN ISO 4263-1														
Reaction to seal material SRE-NBR 1. Relative change in volume in %	DIN 53538-1 and DIN ISO 1817	0 to 15	0 to 12	0 to 12	0 to 10	0 to 10	0 to 15	0 to 12	0 to 12	0 to 10	0 to 10	0 to 10	0 to 10	0 to 10	0 to 10
Change in Shore A hardness	DIN 53505 and DIN ISO 1817	0 to -8	0 to -7	0 to -7	0 to -6	0 to -6	0 to -8	0 to -7	0 to -7	0 to -6	0 to -6	0 to -6	0 to -6	0 to -6	0 to -6
Ash (oxidised ash) proportion of mass in %	DIN 51757														
Corrosion protection for steel, process A	DIN ISO 7120			Passed					Passed						
Corrosion protection for copper, corrosion category	DIN EN ISO 2160			max. 2					max. 2						
Relative drop in viscosity due to shearing after 20 hrs (%)	DIN 51350-6														
Brugger test (N/mm ²)	DIN 51347-1														
Compatibility with non-ferrous heavy metal	VDMA sheet 24570														
Truck-gear torque-bias test machine, damage performance level (min.)	DIN 51354-2 or ISO 14635-1				10										
FT infrared spectroscopy	DIN 51451														
RULER test	In accordance with WEARCHECK														
ASE in accordance with ICP procedure	DIN 51396-1														

- a Please find supplier specifications in the manufacturer's datasheet. The datasheet must be included with the test report.
- b The value given in the table corresponds to the current level of technology and applies to the condition on delivery. The purity specified in the Linde installation drawing must always be ensured by means of careful filtration when filling.
- c Additional tests may be agreed between Linde Hydraulics and the customer in particular cases (depending on the application).
- d Replaces vane cell pump test; actual values for fresh oil.
- e Reference for fresh oil.
- f Actual values for additives (P = phosphorous, S = sulphur, Ca = calcium, Zn = zinc).

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