


SIGN & DATE	ISE & CPL	VIRENDRA KUMAR	Virendra Kumar	DRAWN	RPS /UKH	SIGN & DATE	
	TSX	KISHAN LAL	Kishan Lal	WORKED	RCA	19.6.01	
	QAX	S.S. CHAUHAN	S.S. Chauhan	CHECKED	RCA	19.6.01	
	AGREED DEPTT.	NAME	DATE & SIGN	SUPERVISED	BSS	19.6.01	
INVENTORY No.	P-5573	APPROVED			K.M. Singh	20/6/2001	8:20
		ADDL. GENERAL MANAGER					Gr. No.
	REV. NO. 01			PREPARED:		ISSUED:	DATE
	DATE: 17-11-04			S.T.E-TG		S.T.E-TG	20-6-2001

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1.0 SCOPE:

This specification is applicable for fire resistant fluids, hereafter referred to as FRF, used as a pressure transmitting medium in the turbine control and governing system, electro-hydraulic actuators (compact drives and electro-hydraulic drives) with integrated hydraulic supply (nominal pressure 160 bar). The specification is based on TLV 9012 AUSF 01; 9012 02.

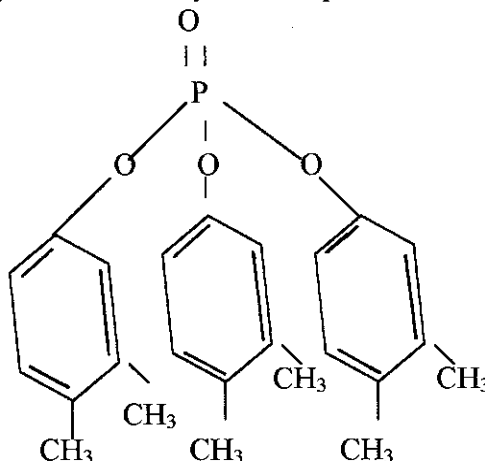
2.0 GENERAL REQUIREMENTS:

2.1 TYPE OF FIRE RESISTANT FLUID:

The FRF shall be Triarylphosphate esters type free from water content. The FRF is designated as HFD according to DIN 51502.

2.2 CHEMICAL COMPOSITION:

The FRF shall be 100% natural Trixylenyl phosphate (TXP), a reaction product of phosphorus oxychloride and xylol. This product has the following chemical formula.



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The final product must be free of neurotoxic quantities of ortho-cresol-compounds. In order to improve certain properties e.g. corrosion protection, oxidation stability, additives may be included provided they have no negative effect on the materials of the FRF-system or its operation.

2.3 CORROSION PROTECTION:

- The FRF shall not cause corrosion to the following materials:
Steel, Copper, Copper Alloys, Zinc, Tin, Aluminum.
- The FRF must be capable of providing sufficient corrosion protection to the materials used in the FRF-system.
- The FRF will be continuously regenerated with a regeneration agent.
- The FRF must not cause any erosion or corrosion on the edges of the control elements.

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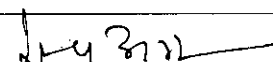
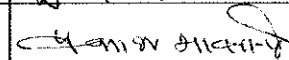
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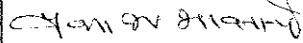
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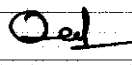
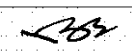
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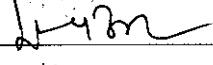
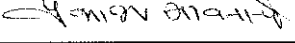




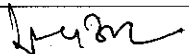
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SUPERSEDES INVENTORY No.	<p>2.4 <u>VISCOSITY GROUP:</u></p> <p>The FRF shall be of viscosity group ISO VG 46.</p> <p>2.5 <u>LIFE TIME:</u></p> <p>Under the mentioned conditions and with regular regeneration, the FRF must provide a minimum life time of 25000 operating hours without any significant change in its properties. The maximum permissible limit of alteration in parameters during its working life are indicated under clause 2.13.</p> <p>2.6 <u>SHEAR STABILITY:</u></p> <p>The FRF must be shear-stable . It should not contain Viscosity Index (VI) improver.</p> <p>2.7 <u>FIRE RESISTANCE:</u></p> <p>The FRF leaking from the system must not ignite or burn in contact with hot surface (upto 550°C).</p> <p>2.8 <u>THERMAL STABILITY:</u></p> <p>The FRF must be capable for withstanding a continuous temperatures of 75°C without physical or chemical degradation.</p> <p>2.9 <u>COMPATIBILITY WITH ANOTHER BRAND OF FRF:</u></p> <p>The FRF must be miscible with traces (Max. 3% by Volume) of TXP of another brand. There should be no deterioration of the FRF in the presence of such trace quantities.</p> <p>2.10 <u>COMPATIBILITY WITH PACKING MATERIAL:</u></p> <p>The FRF must be compatible with the following packing materials used in the system:</p> <p>Fluorocarbon rubber (FKM), butyl rubber (IIR), Polytetrafluoroethylene (PTFE), Polyethelene (PE), Polyamide (PA), Di-isocyanate adhesive, Polyurethane / Polyester.</p> <p>The FRF should not have a negative influence on its air-separation capability in the presence of above packing materials.</p> <p>2.11 <u>PHYSIOLOGICAL CONSIDERATIONS:</u></p> <p>The FRF must not cause a safety or health hazard to the persons working with it provided that normal good industrial hygiene practices are followed.</p>				
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COPYRIGHT AND CONFIDENTIAL <small>The information on this document is the property of Bharat Heavy Electricals Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company.</small>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th rowspan="2" style="width: 40%;">PROPERTY</th> <th rowspan="2" style="width: 15%;">NUMERICAL VALUE</th> <th rowspan="2" style="width: 10%;">UNIT</th> <th colspan="2" style="width: 35%;">TEST METHOD</th> </tr> <tr> <th style="width: 15%;">DIN / ISO</th> <th style="width: 20%;">ASTM</th> </tr> <tr> <td>Kinematic Viscosity at 40 °C (ISO VG 46)</td> <td>41.4 - 50.6</td> <td>mm²/s</td> <td>DIN 51 562-1</td> <td>D 445</td> </tr> <tr> <td>Air release at 50 °C</td> <td>≤ 3</td> <td>minutes</td> <td>DIN 51 381</td> <td>D 3427</td> </tr> <tr> <td>Neutralisation number</td> <td>≤ 0.1</td> <td>mg KOH/g</td> <td>DIN 51 558-1</td> <td>D 974</td> </tr> <tr> <td>Water content</td> <td>≤ 1000</td> <td>mg/kg</td> <td>DIN 51 777-3</td> <td></td> </tr> <tr> <td>Foaming at 25 °C : Tendency</td> <td>≤ 100 ≤ 450</td> <td>ml sec</td> <td></td> <td>D 892 (Seq.1)</td> </tr> <tr> <td>Stability</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Water separability</td> <td>≤ 300</td> <td>sec</td> <td>DIN 51 589-1</td> <td></td> </tr> <tr> <td>Demulsification</td> <td>≤ 20</td> <td>minutes</td> <td>DIN 51 599</td> <td>D 1401</td> </tr> <tr> <td>Density at 15 °C</td> <td>≤ 1250</td> <td>kg/m³</td> <td>DIN 51 757</td> <td>D 1298</td> </tr> <tr> <td>Flash point (Cleveland open cup)</td> <td>> 235</td> <td>°C</td> <td>DIN/ISO 2592</td> <td>D 92</td> </tr> <tr> <td>Ignition temperature</td> <td>> 550</td> <td>°C</td> <td>DIN 51 794</td> <td></td> </tr> <tr> <td>Wick flame persistence time</td> <td>≤ 5</td> <td>sec</td> <td>DIN/ISO 14935</td> <td></td> </tr> <tr> <td>Pour point</td> <td>≤ -18</td> <td>°C</td> <td>DIN/ISO 3016</td> <td>D 97</td> </tr> <tr> <td>Particle distribution *</td> <td>≤ 15/12</td> <td>Code</td> <td>ISO 4406</td> <td></td> </tr> <tr> <td>Chlorine content</td> <td>≤ 50</td> <td>mg/kg</td> <td>DIN 51 577-3</td> <td></td> </tr> <tr> <td>Oxidation stability</td> <td>≤ 2.0</td> <td>mg KOH/g</td> <td>DIN 51 373</td> <td></td> </tr> <tr> <td>Hydrolytic stability Change of neutralisation number</td> <td>≤ 2.0</td> <td>mg KOH/g</td> <td>DIN 51 348</td> <td></td> </tr> <tr> <td>Electrical resistivity</td> <td>> 50</td> <td>MΩm</td> <td>IEC 247</td> <td></td> </tr> </table>					PROPERTY	NUMERICAL VALUE	UNIT	TEST METHOD		DIN / ISO	ASTM	Kinematic Viscosity at 40 °C (ISO VG 46)	41.4 - 50.6	mm ² /s	DIN 51 562-1	D 445	Air release at 50 °C	≤ 3	minutes	DIN 51 381	D 3427	Neutralisation number	≤ 0.1	mg KOH/g	DIN 51 558-1	D 974	Water content	≤ 1000	mg/kg	DIN 51 777-3		Foaming at 25 °C : Tendency	≤ 100 ≤ 450	ml sec		D 892 (Seq.1)	Stability					Water separability	≤ 300	sec	DIN 51 589-1		Demulsification	≤ 20	minutes	DIN 51 599	D 1401	Density at 15 °C	≤ 1250	kg/m ³	DIN 51 757	D 1298	Flash point (Cleveland open cup)	> 235	°C	DIN/ISO 2592	D 92	Ignition temperature	> 550	°C	DIN 51 794		Wick flame persistence time	≤ 5	sec	DIN/ISO 14935		Pour point	≤ -18	°C	DIN/ISO 3016	D 97	Particle distribution *	≤ 15/12	Code	ISO 4406		Chlorine content	≤ 50	mg/kg	DIN 51 577-3		Oxidation stability	≤ 2.0	mg KOH/g	DIN 51 373		Hydrolytic stability Change of neutralisation number	≤ 2.0	mg KOH/g	DIN 51 348		Electrical resistivity	> 50	MΩm	IEC 247	
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SUPERSEDES INVENTORY No.	<p>2.13 <u>LIMIT VALUES:</u></p> <p>The following limit values should not be exceeded during the required life time:</p> <p>a) Kinematic viscosity: Maximum alteration $\pm 5\%$ referring to the condition on delivery</p> <p>b) Neutralisation number: Maximum increase 0.20 mg KOH/g referring to the condition on delivery</p> <p>c) Air release: Max. 12 minutes</p> <p>d) Foaming at 25 degrees centigrade: Tendency: max 200 ml Stability: max 450 s</p> <p>3.0 <u>INFORMATION REQUIRED TO BE FURNISHED ALONG WITH THE OFFER:</u></p> <p>3.1 The bidder shall furnish the complete technical information of the offered product which may also include a) product description, b) chemical name and structure, c) Infrared spectra of the fluid, d) properties, e) disposal procedure, f) minimum working life, g) storage, handling and safety instructions, h) shipping method to be adopted at the time of delivery.</p> <p>3.2 The bidder shall furnish confirmation regarding compliance of all the requirements as specified in this purchase specification along with the offer. In case of any deviation, the same shall be clearly informed by the bidder at the time of offer.</p> <p>3.3 The bidder shall submit list of their customers utilising the fluid for application defined as per clause 1.0.</p> <p>3.4 The offered grade of FRF should be of approved grade by M/S Siemens, Germany.</p> <p>3.5 The approval of FRF does not make the supplier free from their responsibility for the quality of their product. The purchaser must be informed without fail in case of any alteration in their product or manufacturing process. In such cases a new approval by BHEL will become necessary.</p> <p>4.0 <u>DOCUMENTS TO BE FURNISHED AFTER PLACEMENT OF ORDER:</u></p> <p>4.1 The supplier shall inform about the test results from internationally accredited lab giving the batch no., parameter, actual value obtained, test method of the batches proposed to be delivered and take approval from the purchaser before its despatch. As a minimum the following parameters have to be checked as per clause 2.12. Viscosity; air release; neutralisation number; water content; foaming tendency, water separability or demulsification.</p> <p>4.2 Certificate of compliance to the specification, and also certificate of compliance to the properties as per clause 2.12 as well as chemical structure formula as per clause 2.2 shall be furnished.</p> <p>4.3 The supplier shall furnish a copy of Infrared Spectra of the batches proposed to be delivered.</p>				
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SUPERSEDES INVENTORY No.		<p>5.0 TEST CERTIFICATES / DOCUMENTS TO BE SUBMITTED WITH SUPPLIES:</p> <p>10 nos. of hard copies and 3 nos. of soft copies of the following documents shall be furnished by the supplier along with each supply. The customer's and project's name shall be indicated on each document as prescribed by the purchaser.</p> <p>a) The test certificates as per clause 4.1 and the compliance certificate to the effect that the product supplied is natural trixylenyl phosphate ester fluid and properties as per clause 2.12.</p> <p>b) The supplier shall furnish Material Safety Data Sheet (MSDS) covering all information relating to human safety and environmental impacts of the hazardous materials particularly during its transportation, storage, handling and disposal.</p> <p>c) Marking of containers: The FRF must be delivered in cleaned containers. The following information are to be clearly indicated on each container:</p> <p>(i) Product name, manufacturer / supplier, filling date, batch number, Net weight, Gross weight, Expiry date.</p> <p>(ii) Corresponding symbol and minimum worded cautionary notice for flammable/ corrosive / toxic / harmful / irritant and oxidising etc. as applicable.</p> <p>6.0 SPECIAL AGREEMENTS:</p> <p>Special agreements concerning variations from the requirements of this specification need authorisation by the purchaser. These must be settled through letter.</p> <p>7.0 FILLING OF THE SYSTEM BY THE SUPPLIER:</p> <p>7.1 Before filling the system a 2 litre sample shall be taken and sent to the laboratory for analysis. In the case of more than one batch, the supplier will blend a 2 litre sample from those batches. The proportions of the blend should reflect the final mixture that will result from filling the various batches into the hydraulic control system. Permission for filling will be given by the owner / purchaser after review of test results of the sample.</p> <p>7.2 Filling of the system shall be made by the supplier at his own risk and expense.</p> <p>7.3 The filling is to be made through a filter unit having a mesh of 5 micron. The tools used for filling the system must not affect the quality of FRF.</p> <p>8.0 SAFETY MEASURES:</p> <p>The safety precautions which are to be observed by the personnel dealing with FRF, shall be clearly demonstrated / informed to the Purchaser by the FRF supplier in the form of specific safety instructions.</p> <p>9.0 CROSS REFERRED STANDARDS: 1</p> <p>DIN 51 502; DIN 51 562-1; DIN 51 381; DIN 51 558-1; DIN 51 777-3; DIN 51 589-1; DIN 51 599; DIN 51 757; DIN ISO 2592; DIN 51 794; DIN ISO 14935; DIN ISO 3016; ISO 4406; DIN 51 577-3; DIN 51 373; DIN 51 348; IEC 247; ASTM D 445; ASTM D 3427; ASTM D 974; ASTM D 1744; ASTM D 892 (Seq.1); ASTM D 1401; ASTM D 1298; ASTM D 92; ASTM D 97.</p>			
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