

	<p>TECHNICAL SPECIFICATION</p>	<p>WT-09/OBR PR/PD/48</p>
<p>Warter Fuels JSC</p>	<p>Aviation Gasoline AVGAS 100LL</p>	<p>Edition VIII</p>

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1. Scope of TS

The scope of TS is aviation gasoline AVGAS 100LL, which is the mixture of hydrocarbons, obtained from conservative and secondary processes of the crude petroleum and suitable amounts of antiknock, dyeing, antioxidant and antistatic additives

Requirements concerning TS subject were developed basing on the DEF STAN 91-90 Issue 4, ASTM D 910 and defence standard NO-91-A235.

2. Usage scope of TS subject

Aviation gasoline is used to power piston engines

The product meets the requirements of DEF-STAN 91-90 Issue 4, ASTM D910 and defence standard NO-91-A235

3. Division and designation

Division – N/A

Designation – Aviation Gasoline AVGAS 100LL.

4. Requirements and research

4.1 General properties

The Producer is obliged to add dyeing and antiknock additives to the aviation gasoline. Other additives specified in this TS may also be used. The Producer is obliged to publish the name and quantity of the added additives in quality certificate. The aviation gasoline AVGAS 100LL shall be produced in accordance with the clearly established technology.

4.1.1. Antiknock additives

As antiknock additives, mixtures of compounds containing not less than 61% (m / m) of tetraethyl lead and such amount of ethylene dibromide to provide two atoms of bromine per atom of lead are used. TEL - B ethyl liquid from Innospec / Alcor is used as a antiknock additive. The amount of additive should be such, so the concentration of lead in the finished gasoline does not exceed 0,56 g Pb / l.

4.1.2. Dyeing additives

Aviation gasoline should contain the identifying blue color additive: 1,4 dialkylaminoanthraquinone in amount not exceeding 2,7 mg/l.

4.1.3. Antioxidant additives

Antioxidant additives prevent from the formation of resins and other products of oxidation as well as from knocking out the lead compounds. The content of the additive based on the weight of the active ingredient, should not exceed 12.0 mg / l. As the antioxidant additive BHT (2,6-ditertbutyl-4-methylphenol) is used.

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4.1.4. Antistatic additives

Antistatic additives are added to the gasoline in an amount providing the conductivity in accordance to detailed requirements table, ie. within the range of $50 \div 450$ pS / m. The antistatic additive Stadis 450 is used. The concentration of the additive in the gasoline should not exceed 3.0 mg / l.

4.1.5. Durability

The aviation gasoline meets the requirements of TS within two years from the date of production under the condition of proper storage.

4.1.6. Packaging, storage and transportation

Aviation gasoline AVGAS 100LL is delivered in a special tank trucks, iso-tank containers and steel drums approved for transport of aviation gasoline . Make sure that the packaging in which gasoline will be transported is clean, dry and undamaged. Each package unit as well as truck's transport documents should clearly and permanently indicate:

- Name of the gasoline
- Amount of gasoline in packaging unit
- Production date and batch number
- Warning of fire risk and safety instruction
- Commercial contract number (if required)

Always store gasoline in containers that protects it from air, moisture and mechanical impurities. Storage places should be protected from direct sunlight, heating (underground tanks with limited air exchange). This reservation is for the reduction of both the losses associated with the evaporation and loss of the lightest components, which will change two key parameters of gasoline: vapor pressure and fractional composition. Tanks should be marked with information boards with the identification numbers of ADR threats and material identifying number UN:

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1203

According to the ADR 2013-2015 agreement, Part IV regulations of ADR, concerning permitted rate of filling, and the properties of aviation gasoline manufactured by the WARTER FUELS JSC, the determined permissible rate of filling of steel drums to 92.5% of nominal capacity. At the same time indicates that the rate of filling is set for normal conditions of temperature -20 to + 55 ° C.

4.2 Specific properties

4.2.1 Research

For each batch of aviation gasoline (after the composing), the following analysis must be performed- in accordance with the requirements table:

- Appearance
- Colour
- Fractional composition
- Density at temp. 15°C,
- Reid vapour pressure at temp. 37,8°C,
- Freezing point,

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- Electrical conductivity at temp. 20°C,
- Motor Octane Number MON,
- Existent gum,
- Oxidation stability at temp. 100°C, time 16h,
- Sulfur content,
- Lead content,
- Specific energy,
- Copper corrosion
- Water reaction

Performance number determination, should be performed once a quarter

The standards and requirements for these designations refer to the table of specific properties

In case of receiving the aviation gasoline by a military entity, testing range is specified in separate documents (such as a contract, the defense norm etc.), agreed with the Customer.

4.2.2. Appearance evaluation

The test product should be poured into a glass cylinder with a diameter of 40 mm to 50 mm, made of clear glass, then it should be visually inspected in transmitting light. The test should be performed at a temperature of $20 \pm 5^\circ\text{C}$. Gasoline meets the requirements, if the study is a clear liquid, without sediment, turbidity, and water.

4.2.3. Sampling.

The sample must be taken from the tank, after the completion of mixing, in the amount of 5 l for full range of test with accordance to WT No. QI / 7.5 / 01 / IN / 51 "Manual sampling".

4.2.4. Specific properties of Avgas 100LL

No.	Properties	Unit	Limits	Test method
1	Appearance	-	Clear, bright liquid without any solid particles and undissolved water at ambient temp.	Acc. p.4.2.2. WT-09/OBR PR/PD/48 ASTM D 4176
2	Colour	-	Blue	ASTM D 2392
3	Lovibond RYBN color scale	-	R - Y - B 1,7 ÷ 3,5 N -	IP 17 IP 569
4	Antiknock rating - Motor Octane Number (MON) - Performance number *	- -	Min 99,6 Min 130	ASTM D2700 IP 236 ASTM D 909 IP 119

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5	Fractional composition :	°C	To be reported	ASTM D 86 IP 123
	- Initial boiling point	°C	Max 75	
	- 10% (V/V)	°C	Min 75	
	- 40% (V/V)	°C	Max 105	
	- 50% (V/V)	°C	Max 135	
	- 90% (V/V)	°C	Max 170	
	- Final boiling point	°C	Min 97	
	- Performance	% (v/v)	Max 1,5	
	- Residue	% (v/v)	Max 1,5	
	- Loss	% (v/v)	Min 135	
	Sum of 10% and +50% evaporated temperatures	°C		
6	Sulfur content	% (m/m)	Max 0,05	ASTM D 2622 ASTM D 1266 ASTM D 5453 IP 107
7	Lead content	g Pb/l	Max 0,56	ASTM D 5059 ASTM D 3341 IP 270
8	Density at 15°C	kg/m ³	To be reported	ASTM D 4052 ASTM D 1298 IP 365
9	Specific energy	MJ/kg	Min 43,5	ASTM D 4529 ASTM D 3338 IP 12
10	Freezing point	°C	Max -58	ASTM D 2386 ASTM D 7153 IP 16
11	Corrosion to copper strip-2h at 100°C	Corrosion rate	Max 1	ASTM D 130 IP154
12	Existent gum	mg/100 ml	Max 3	ASTM D 381 IP 131
13	Water reaction- volume change	ml	Max 2	ASTM D 1094 IP 289
14	Electrical conductivity at 20°C	pS/m	50 ÷ 450	ASTM D2624 IP 274
15	Reid vapour pressure at 37,8 °C	kPa	38 ÷ 49	ASTM D 5190 ASTM D 5191 ASTM D 323 IP 69
16	Oxidation stability at temp. 100°C, time 16h			ASTM D 873 IP138
	- Potential gum	mg/100 ml	Max 6	
	- Precipitate	mg/100 ml	Max 2	

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| <ol style="list-style-type: none"> 1) The distillation was carried out as for Group 2, during distillation, the temperature of the condenser is maintained within 0°C to 15°C. 2) The value of the properties in respect of which the requirements are specified as "To be reported" are declared by the product manufacturer 3) In case when the user applies an electrostatic additive, measurement should be taken in an ambient temperature. In the quality certificate, please indicate the temperature reading and the value of electric conductivity, which should be within 50 pS/m do 450 pS/m. 4) Performance number determination, should be performed once a quarter* |
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THE END
ADDITIONAL INFO

TECHNICAL SPECIFICATION ISSUED BY:
WARTER FUELS S.A.