

型号合格证数据单
TYPE CERTIFICATE DATA SHEET

编号/No:	TC0087E
版次/Revision:	0
型别/Model:	AES100
批准人/Approved By:	
职务/Title:	司长
日期/date:	2024-08-16

本数据单是型号合格证（编号：TC0087E）的组成部分，它规定了获得该型号合格证的产品满足中国民用航空规章相关适航要求的条件和限制。

This data sheet, which is part of Type Certificate (No: TC0087E), prescribes condition and limitation under which the product for which the Type Certificate was issued meets the airworthiness requirements of the Chinese Civil Aviation Regulations.

型号合格证持有人/Type Certificate Holder:

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第一部分：AES100 型别技术数据/ SECTION A: Model AES100 TECHNICAL DATA

A I. 产品型别概述/Model General

产品型别/ Model	类别/ Category	型号合格证申请日期/ Application Date	型号合格证批准日期/ Approval Date
AES100	航空发动机/Aeroengine	2020年08月04日/ 04 August 2020	2024年08月16日/ 16 August 2024

A II. 生产依据/ Production Basis

型别/Model	生产依据/Production Basis
AES100	暂无/None

A III. 审定基础/ Certification Basis

型别/Model	审定基础/Certification Basis	
AES100	适 航 标 准 /Airworthiness Standards	CCAR-33-R2 航空发动机适航规定 2016年4月17日实施。 CCAR-33-R2 Airworthiness Regulation for Aeroengine, implemented on 17 April 2016.
	专 用 条 件 /Special Conditions	AES100型发动机安装节不声明批准寿命，SC-33-005。 Special Condition for non-declaration of approved life for AES100 engine mounts, SC-33-005.
	等效安全/ELOS	无/None
	豁免/Exemption	无/None
	环 保 要 求 /Environmental Standards	CCAR-34 涡轮发动机飞机燃油排泄和排气排出物规定 2002年4月19日起实施。 CCAR-34 Fuel Venting and Exhaust Emission Requirements for Turbine Engine Powered Airplanes, implemented on 19 April 2002.

A IV. 技术特征和使用限制/Technical Characteristics and Operational Limitations

型别/Model	AES100
型号设计定义/Type Design Definition	AES100 发动机为单转子燃气发生器、功率前输出的涡轮轴发动机，由 3 级轴流+1 级离心组合压气机、环形回流燃烧室、双级燃气涡轮+双级动力涡轮、附件传动等部件和双通道全权限数控系统和健康管理系统组成。型号设计详细定义参见文件《AES100 发动机取证构型清单》（S100-ML-0517，版本 G 或后续批准版本）。 /The AES100 engine is a turboshaft engine of single rotor gas generator with front power output, consisting of a three-stage axial and a single-stage centrifugal compressor, a reverse flow annular combustion chamber, a two-stage gas generator turbine, a two-stage power turbine, accessory gearbox etc., and systems such as FADEC and a health management. Detailed type design definition sees 《AES100 Certification Configuration BOM》（S100-ML-0517G, or later approved revisions）.
额定值/Ratings	

30 秒 OEI 功率 /30-second OEI Power	1238 kW
2 分钟 OEI 功率 /2-minute OEI Power	1168 kW
连续 OEI 功率 /Continuous OEI Power	1100 kW
起飞功率（5 分钟） /Take-off Power（5 min）	1100 kW
最大连续功率 /Maximum Continuous Power	957kW
注：/Note: 上述各状态的功率为最低值，功率是在试验台安装条件下得到。不考虑发动机进口漩涡、压降、加温，不考虑温度畸变、压力畸变和气流角畸变，不考虑排气管背压的影响。发动机最低非安装功率按以下条件确定： /All ratings above are the lowest power and obtained under test bench installation conditions without considerations of the swirl, pressure drop, heating, temperature distortion, pressure distortion, airflow angle distortion at the engine inlet and the back pressure at exhaust assemblies. The minimum uninstalled power ratings of the engine are determined under the following conditions: • 海平面标准大气条件；/ISA at Sea Level; • 无电机功率提取（除发动机运行所需之外）；/With no mechanical off-take（other than those required for Engine operation）； • 燃油低热值为 43136 kJ/kg 并符合安装使用手册中的相关要求；/Fuel Low Heat Value: 43136kJ/kg and meeting the relevant requirements in the Installation and Operating Manual; • 动力涡轮输出转速 20900r/min；/Power turbine output shaft rotation speed 20900r/min; • 滑油符合安装使用手册的要求；/The oil should meet the requirements of Installation and Operating Manual; • 无安装损失；/No installation losses; • 无防冰引气/直升机引气；/No anti-icing /Customer bleed flow; • 试验台进气装置符合安装使用手册的要求。/The intake used at test bench should meet the requirements of Installation and Operating Manual.	
工作高度/Operating Altitude	
最大高度/Maximum Altitude	6000m
控制系统/Control System	
控制系统说明/Control System Description	数控系统由电子控制器，数据记录仪，传感器，电缆等组成。健康管理系统由健康监视单元，振动传感器，电缆等组成。 /The digital control system include ECU, data record unit, sensor, cables, etc. The healthy management system include EMU, vibration sensor, cables, etc.

软硬件号 /Part Number of Software and Hardware		ECU 软件: JRJ55.C.1.14 或后续批准的版本; /ECU software: JRJ55.C.1.14 or later approved revisions; ECU 硬件: D/JDK-81, B010203 或后续批准的版本; /ECU hardware: D/JDK-81, B010203 or later approved revisions; EMU 软件: 18S2.480.00338, V1.6 或后续批准的版本; /EMU Software: 18S2.480.00338, V1.6 or later approved revisions; EMU 硬件: D/SSJ-70, D 或后续批准的版本; /EMU Hardware: D/SSJ-70, D or later approved revisions; 数据记录仪: D/QLJ-12, A010102 或后续批准的版本。/Data Recorder: D/QLJ-12, A010102 or later approved revisions. 后续批准的版本将会以服务通告的形式发布。/The latest approved version will be published as a Service Bulletin.	
液体（燃油/滑油/添加剂） /Fluids(Fuel, Oil, Additives)		详见安装使用手册第六章和第八章 S100-SJ-0013。/Refer to Installation and Operating Manual S100-SJ-0013 chapter 6 and 8 for details.	
物理特性/Physical Characteristics			
主要尺寸 /Principal Dimensions		长度/Length	1161 mm
		宽度/Width	614 mm
		高度/Height	690 mm
		注: 含排气组件/Note: include exhaust assembly	
最大干重/ Maximum Dry Weight		219.3kg 注: /Note: 不含装机电缆和尾喷管排气组件/Without cables installed on helicopter and exhaust assembly	
温度限制/ Temperature Limits			
动力涡轮进口温度（T45） /Inlet Temperature at Power Turbine(T45)		起动超温保护 /Starting overtemperature protection	920℃持续 10 秒或者 1020℃ /920℃ continued 10 seconds or 1020℃
		30 秒 OEI/30-second OEI	900℃
		2 分钟 OEI/2-minute OEI	870℃
		连续 OEI/Continuous OEI	850℃
		AEO 瞬态（20 秒） /AEO transient (20 seconds)	860℃
		起飞（5 分钟）/Take-off（5 min）	850℃
		最大连续/Maximum Continuous	815℃
最低滑油温度（起动） /Minimum oil temperature (start)		-40℃, 5cSt 滑油 /-40℃, 5cSt oil	
最低滑油温度（输出功率前） /Minimum oil temperature (before outputting power)		详见安装使用手册第二章 S100-SJ-0013。 /Refer to Installation and Operating Manual S100-SJ-0013 chapter 2 for details.	
最高滑油温度 /Maximum Oil Temperature:		+130℃	
发动机进口燃油 ^{[1][2]} 温度	最低燃油温度 /Min. Fuel Temperature	-40℃	注: /Note: [1]详见安装使用手册第六章 S100-SJ-0013。 /[1] Refer to Installation and Operating Manual S100-SJ-0013 chapter

/Fuel Temperature at Engine Inlet	最高燃油温度 /Maximum Fuel Temperature	+57℃	6 for details. [2] 当温度低于-10℃时，强制使用防冰添加剂。详见安装使用手册第六章 S100-SJ-0013。 / [2] The use of anti-icing additive is mandatory for a temperature bellow -10℃. Refer to Installation and Operating Manual S100-SJ-0013 chapter 6 for details.	
压力限制/Pressure Limits				
发动机进口燃油 ^[1] 压力 /Fuel ^[1] Pressure at Engine Inlet	最小燃油压力 /Minimum Fuel Pressure	运行阶段/In Operation	40kPa（绝对） (/absolute)	注：/Note: [1]详见安装使用手册第六章 S100-SJ-0013。 /[1] Refer to Installation and Operating Manual S100-SJ-0013 chapter 6 for details.
		起动/再起 /Start/Restart	25kPa（相对） (/relative)	
	最大燃油压力 /Maximum Fuel Pressure	运行阶段 /In Operation	150kPa（相对） (/relative)	
		停车/Stop	200kPa（相对） (/relative)	
滑油压力/Oil Pressure		发动机运行时正常滑油压力为燃气发生器转速相关函数。详见安装使用手册第八章 S100-SJ-0013。 / The normal oil pressure limits are functions related to the speed of gas generator during the engine operation. Refer to Installation and Operating Manual S100-SJ-0013 chapter 8 for details.		
转速限制/Speed Limits				
燃气发生器转速（Ng）* /Gas Generator Rotation Speed (Ng) 100%Ng=45000r/min	30 秒 OEI /30-second OEI		102.8% *	
	2 分钟 OEI /2-minute OEI		101.2%	
	连续 OEI /Continuous OEI		100%	
	AEO 瞬态（20 秒） /AEO transient (20 seconds)		101% **	
	起飞（5 分钟） /Take-off（5 min）		100% ***	
	最大连续/Maximum Continuous		98%	
	注：/Note: *: 最大瞬态限制：从起飞状态加速到 30 秒 OEI 状态时，燃气发生器物理转速瞬态会有 1.5%的超调量； /*: Maximum transient limits: consideration of 1.5% overspeed of gas generator physical speed when engine is accelerated from take-off to 30-second OEI; **: AEO 状态瞬态限制：101%，考虑从空慢状态加速到起飞状态时，燃气发生器物理转速瞬态会有 1%的超调量 /**: AEO transient limits: 101%, consideration of 1% overspeed of gas generator physical rotation speed when engine is accelerated from flight idle to take-off. ***: 数控系统 AEO 状态稳态限制：100%。 /***: Steady limit of AEO defined in digital control system: 100%.			
最小动力涡轮转速（Np）	稳态/Steady		99.5%	

/Minimum Power Turbine Rotation Speed (Np) 100%Np=20900r/min		瞬态（20 秒）/Transient (20 seconds)		95%				
最大动力涡轮转速（Np） /Maximum Power Turbine Rotation Speed (Np) 100%Np=20900r/min		稳态/Steady		100.5%				
		瞬态（20 秒）/Transient (20 seconds)		105%				
扭矩限制/ Torque Limits 注：装直升机后的最大扭矩限制/Note: Torque Limits at Helicopters								
OEI 瞬态（10 秒） /Transient (10 seconds)		592N.m		注：/Note: [1]通过安装在 ECU 中的扭矩限制器来限制最大扭矩值，以保护直升机主减速器。 / [1] The maximum torque value specified are limited by torque limits embedded in the ECU to protect the helicopter main gearbox.				
30 秒 OEI/30-second OEI		561N.m ^[1]						
2 分钟 OEI/2-minute OEI		536N.m ^[1]						
连续 OEI/Continuous OEI		466N.m						
AEO 瞬态（20 秒） /AEO transient (20 seconds)		489N.m						
起飞（5 分钟）/Take-off（5 min）		466N.m ^[1]						
最大连续/Maximum Continuous		439N.m						
由发动机驱动的直升机附件/Helicopter Accessory Derived by Engine								
起动/发电机 /Starter/Generator							最大连续轴功率 *** Maximum Continuous shaft power	
	旋转方向 /Rotation direction	转速 Rotation Speed (rpm)	最大过载扭矩 Maximum Torque in overload condition (N.m)	最大静态悬臂力矩 Maximum static cantilever (N.m)	最大不平衡量等级（根据 ISO 1940）** Maximum unbalance (ISO 1940) G	保险轴最大剪切扭矩 Shear shaft maximum breakaway torque (N.m)	空慢、AEO 和连续 OEI Flight Idle, AEO and Continuous OEI (kW)	30s OEI 和 2min OEI 30-second OEI and 2-minute OEI (kW)
	逆时针* CCW*	11076 （100%）	90	24.75	0.4**	180.8	17.14	17.14

	注: /Note: *: 旋转方向是基于从发动机后向前看确定的。 /*: CCW=Counter Clockwise. The rotation direction is based on the engine view from the rear to front. ***: 起动/发电机转子件的最大不平衡等级。 /**: Maximum unbalance level of the rotating parts of the starter/generator. ***: 在整个飞行包线内, 发动机允许在空慢、AEO 或 OEI 状态下从燃气发生器持续提取 17.14kW 机械功率 (即 12kW 的电功率)。 ****: The Engine allows 17.14kW continuous mechanical power off-take on the gas generator in flight idle, AEO or OEI ratings on the whole flight envelope; corresponding to an electrical power of 12 kWe.
引气/Bleed	除起动阶段、地面慢车状态和发动机状态大于连续 OEI 状态 (Ng 或 T45 高于连续 OEI 限制) 外, 发动机允许进行直升机引气。 /Except the use of air bleeding is not authorized in starting mode, ground idle and the engine rating is higher than Continuous OEI, helicopter air bleeding is allowed. 直升机从单台发动机最大引气量限制如下: /The maximum air bleeding for helicopter from single engine is following: • 发动机压比小于 7 时, 最大引气量为发动机进口空气流量的 2.0%; • /The maximum air bleeding is 2.0% of Engine inlet air flow when engine pressure ratio is less than 7; • 发动机压比不小于 7 时, 最大引气量为发动机进口空气流量的 2.2%(最大不超过 90g/s)。 • /The maximum air bleeding is 2.2% of Engine inlet air flow when engine pressure ratio is not less than 7(Not to exceed 90g/s).
设备/Equipment	详见安装使用手册 S100-SJ-0013。/Refer to Installation and Operating Manual S100-SJ-0013 for details.
部件寿命 /Component Life	详见维护手册 (第 05 章) S100-SJ-0046。/Refer to Maintenance Manual (Chapter 05) S100-SJ-0046 for details.
燃油和滑油过滤 /Fuel and Oil Filtration	详见安装使用手册第六章和第八章 S100-SJ-0013。 /Refer to Installation and Operating Manual S100-SJ-0013 chapter 6 and 8 for details.
进气畸变/Inlet Distortion	详见安装使用手册第四章 S100-SJ-0013。/Refer to Installation and Operating Manual S100-SJ-0013 chapter 4 for details.
安装假设 /Installation Assumption	详见安装使用手册适用章节 S100-SJ-0013。 /Refer to Installation and Operating Manual S100-SJ-0013 applicable chapters for details.
限时放行 (TLD) /Time Limited Dispatch	该发动机未批准限时放行。在直升机起飞前, 所有发动机系统和设备必须正常工作。任何检测到的发动机系统或设备故障必须在飞行前纠正。特殊说明请参见安装使用手册 S100-SJ-0013。 /The engine is not approved for Time Limited Dispatch. All engine systems and equipment must be functional prior to helicopter take-off. Any detected engine system or equipment failure must be corrected before flight. For special instructions, see Installation and Operating Manual S100-SJ-0013.

A V. 批准的技术资料/ Approved Technical Documents

型别/Model	技术资料名称/ Technical Documents name	技术资料编号和版本 Technical Documents number and version	状态/Status
AES100	安装使用手册 Installation and Operating Manual	S100-SJ-0013, B 版或后续批准的版本 / S100-SJ-0013, B or later approved revisions	批准/Approved
	性能手册 Performance Brochure	S100-SJ-0043SH, C 版或后续批准的版本 / S100-SJ-0043SH, C or later approved revisions	批准/Approved
	维护手册/Maintenance Manual	S100-SJ-0040, A 版或后续认可的版本 / S100-SJ-0040, A or later accepted revisions	认可/Accepted
	维护手册适航限制章节 /Airworthiness Limitations Section of the Maintenance Manual.	S100-SJ-0046, B 版或后续批准的版本 / S100-SJ-0046, B or later approved revisions	批准/Approved
	服务通告及服务信函 /Service Bulletins and Service Letters	参见所颁发的相关文件/As issued	/

A VI. 注释/Notes**注释 1/ NOTE 1.**

发动机未验证吸鸟和吸雹能力，仅限于安装在装有防护装置的直升机上。直升机进气道防护装置应能够承受 CCAR-33-R2 33.78 条款要求冰雹、大冰雹和 CCAR-33-R2 33.76 条款要求的鸟撞击。

/ The engine is not certified for bird and hail ingestion, and shall be installed on a helicopter equipped with protection device. The protection device of helicopter intake should be able to withstand impact for hailstorm/hailstones specified in CCAR-33-R2 33.78 and bird in CCAR-33-R2 33.76.

注释 2/ NOTE 2.

AES100 发动机的 ECU 应安装在机身任何着火区之外（即位于有标称点火源的可燃液体泄漏区之外）以及可能导致过热区域之外。相关的安装假设详见安装使用手册。

/ The AES100 engine ECU shall be installed outside of a designated fire zones (that is located outside the flammable liquid leakage area with a rated ignition source) and outside of a zone that might lead to overheat conditions. Corresponding installation assumptions are defined in the Installation and Operating Manual S100-SJ-0013 for details.

注释 3/ NOTE 3.

CAAC 批准的持续适航文件的适航限制章节详见发动机维护手册（第 05 章）（S100-SJ-0046）“适航限制”。

/The CAAC approved Airworthiness Limitations Section of the Instructions for Continued Airworthiness is published in the applicable Engine Maintenance Manual, chapter 5 (S100-SJ-0046) “Airworthiness Limitations”.

注释 4/ NOTE 4.

AES100 发动机不能安装在使用复合材料燃油箱的直升机上。

The AES100 engine cannot be installed on the helicopters that using composite material fuel tanks.

注释 5/ NOTE 5.

AES100 发动机持续适航文件尚未完成,直到持续适航文件完成并获得 CAAC 认可前,任何配装该发动机的直升机都不具备获得适航证的条件。AES100 发动机翻修手册尚未完成,不允许任何人对发动机开展翻修或任何形式的深度维护工作。

Instructions for Continued Airworthiness (ICA) for the AES100 models are incomplete. Helicopter with these engines installed will be eligible for airworthiness certification when the ICAs are completed and accepted by CAAC. The Overhaul Manual is incomplete, without which on person is allowed to overhaul or perform any form of heavy maintenance to the engine.

注释 6/ NOTE 6.

电子控制器的硬件按照 DO-254 的 A 级要求研制,软件按照 DO-178C 的 A 级要求研制。

The hardware in the ECU has been developed in accordance with DO-254 at level A. And the software in the ECU has been developed in accordance with DO-178C at level A.

第二部分：管理信息/SECTION B: ADMINISTRATIVE INFORMATION

B I.型号持有人记录/Type Certificate Holder Record

中国航发湖南动力机械研究所

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B II.修订记录/ Change Records

数据单版次信息/Revision of the Type Certificate Data Sheet

	数据单编号、版次和颁发日期/ Type Certificate Data Sheet Number, Revision and issuance date
当前/ Current	编号TC0087E，版次0。2024年08月16日 No. TC0087E, Revision 0. 16 August 2024
历史/ History	无/None

数据单修订记录/ Change Record of the Type Certificate Data Sheet

版次/Revision	相对上一版的修订记录/Change Record	备注/Remark
0	无/None	

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