



**MINISTRY OF TRANSPORT OF THE RUSSIAN FEDERATION
FEDERAL AIR TRANSPORT AGENCY**

**TYPE CERTIFICATE
DATA SHEET**

№ФАПТ-СТ258-АМД

ARRIUS 2 family engines

**Issue 01
20 December 2016**

Models:

- Arrius 2B2
- Arrius 2K2
- Arrius 2F
- Arrius 2G1

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This Data Sheet is an integral part of Type Certificate № CT258-АМД, Supplement to Type Certificate № CT258-АМД/Д01 and Major Change Approval № ФАВТ-ОГИ-АРИУС2-02 issued for Arrius 2 aviation engine, and defines conditions and limitations, under which the aeronautical product granted with this Type Certificate and Supplements (changes) to it complies with the requirements of Certification Basis

1. Description

Holder of Type Certificate № CT258-АМД

**Safran Helicopter Engines,
64511 Bordes, France**

- Turbomeca before 18 July 2016;
- Safran Helicopters Engines after 18 July 2016

Modular design turboshaft engine. The engine consists of the annular air intake, a centrifugal single stage compressor driven by a single stage turbine, an annular reverse flow combustion, and a single stage free power turbine with through shaft driving a reduction gearbox located in front. Engine models Arrius 2B2, Arrius 2K2, Arrius 2G1 have electronic regulating system (FADEC) with manual back-up. Model Arrius 2F have hydromechanical regulating system.

2. Initial certification data

Type Certificate (TC) № CT258-АМД., issued by IAC Aviation Register on 28.06.2006,
Supplement to TC № CT258-АМД/Д01, issued on 01.12.2011

3. Type Design

Type Design is defined by the following design and operational documentation, effective on the date of Type Certificate or its updates issue introduced in due order.

Models	Arrius 2B2	Arrius 2K2	Arrius 2F	Arrius 2G1
Type Design Definition	0 319 00 720 0	0 319 00 620 0	0 319 00 800 0	0 319 00 633 0
Installation Drawing and Manual	X319N3 001 2	X319N0 001 2	X319L6 001 2	X 319 R4 002 2
Operating Instructions are provided in Installation Manual	X319N3 001 2	X319N0 001 2	X319L6 001 2	X319R4 002 2
Performance Booklet	X319N3 002 2	X319N0 002 2	—	X 319 R4 003 1
- Regular fuels	—	—	X319L6 002 9	—
- Alternative fuels	—	—	X319L6 004 9	—
- Regular fuels (with Tf39*)	—	—	X 319 L6 005 9	—
- Alternative fuels (with Tf39)	—	—	X319L6 006 9	—
- Maintenance Manual	X 319 N3 451 2	X319N0 452 2	X319L6 301 2	X319R4 450 2
- Repair Manual	X 319 N3 500 2	X 319 N0 500 2	X319L6 500 2	X 319 R4 500 2
Effective Airworthiness Directives and Mandatory Service Bulletins				

Note:

* - with hydromechanical unit (HMU) with higher fuel consumption.

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4. Certification Basis

Certification Basis (CB ARRIUS 2) of the Arrius 2 engine family (models Arrius 2B2/ 2K2/ 2F/ 2G1), approved by the IAC Aviation Register on 01 June 2006, includes the following chapters:

1. List of Aviation Regulations AP-33 requirements, issued in 1994
2. Special technical conditions. Include the list of AP-33 requirements, issued in 1994, not applicable to this engine family, as well as special technical conditions, including the following AP-33 requirements, issued in 2004:
 - 33.28 – electrical and electronic engine control systems;
 - 33.29 (c) – Appliances attachment;
 - 33.87 (f) – Long duration tests. Helicopter engines for which 30 second and 2 minute OEI (One Engine Inoperative) regimes are required;
 - 33.88 – High temperature tests.
3. Environmental requirements. Annex 16 ICAO Volume II, Part 2 «Fuel venting».

5. Main characteristics and technical data:

Models	Arrius 2B2	Arrius 2K2	Arrius 2F	Arrius 2G1
Ratings [kW]:				
– 30 seconds OEI	557,0	—	—	—
– 2 minutes OEI	544,0	—	—	—
– 2,5 minute OEI	—	504,0	—	518,4
– Continuous OEI	485,0	504,0	—	477
– Take-off (5 min)	479,0	504,0	322,0	426
– Maximum continuous	432,0	453	322,0	426

Notes:

Power ratings specified in item 5 correspond to minimum values defined under the following conditions:

- ISA conditions at sea level, on test bed;
- No air bleed for the aircraft;
- No intake or exhaust losses;
- No installation loss;
- Output shaft rotation speed:
 - $N_B=6252$ rpm (106%) – Arrius 2B2;
 - $N_B=6360$ rpm (106%) – Arrius 2K2;
 - $N_B=6000$ rpm (100%) – Arrius 2F/2G1.

Engine accessories:

Engine equipment is specified by the applicable Type Design Definition.

Equipment to be supplied by the aircraft manufacturer:

- Starter-generator;
- Oil cooler;
- Front mounts.

Main dimensions, [mm]:

Model	Arrius 2B2	Arrius 2K2	Arrius 2F	Arrius 2G1
– Overall Length	1158,0	973,0	1418,0	973,0
– Overall Height	690,0	638,0	674,0	641,0
– Width	518,0	538,0	489,0	482,0
Dry Weight, [Kg], not more than:	114,3	112,8	103,5	113,8

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6. Operating and Installation Limitations

Models	Arrius 2B2	Arrius 2K2	Arrius 2F	Arrius 2G1
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Permissible Rotor Speed, [rpm / %]:

Maximum Permissible Gas Generator Speed (N1):				
– 30 second OEI rating	57081 / 105,5	—	—	—
– 2-minute OEI rating	56413 / 104,2	—	—	—
– 2,5 minute OEI rating	—	56331 / 104,1	—	56409 / 104,2
– Continuous OEI rating	55187 / 102	55006 / 101,6	—	55094 / 101,8
– Takeoff	54105 / 99,9	55006 / 101,6	54658 / 101	55094 / 101,8
– Maximum Continuous	53564 / 98,9	53706 / 99,2	53846 / 99,5	53795 / 99,4
– Transient overspeed (5 sec)	55187 / 102	57689 / 106,6	—	57689 / 106,6
– Transient regime (20 sec)	—	—	56065 / 103,6	—
Minimum Stabilised Rotor Speed N1:				
	32470 / 60	32470 / 60	—	32470 / 60

Note:

100% N1 = 54117 [rpm]

Maximum Permissible Power Turbine Speed (N2), [rpm / %]:

For an unlimited duration:				
– maximum	46680 / 106	46650 / 106	45769 / 104	46650 / 106
– minimum	41396 / 94	39608 / 90	40488 / 92	39608 / 90
Transient:				
– maximum (20 sec)	47560 / 108	49290 / 112	48410 / 110	49290 / 112
– minimum (20 sec)	37430 / 85	37408 / 85	39608 / 90	37408 / 85
100% N2, rpm	44038	44009	44009	44009

Maximum Permissible Gas Temperature (T45), [°C]:

Starting:				
– unlimited	819	819	800	819
– limited to 5 sec	910	⁽¹⁾	870	⁽¹⁾
In flight:				
– 30 sec OEI rating	1024	—	—	—
– 2 minute OEI rating	994	—	—	—
– 2,5 minute OEI rating	—	990	—	990
– Continuous OEI rating	942	934	—	938
– Take off (5 min)	897	929	870	932
– Maximum continuous	879	882	830	887

Note:

⁽¹⁾ - 861°C – with no failure indication; 910°C – with P0 or T1 failure indication.

Fuel Temperature, [°C]:

– Maximum temperature	Refer to the corresponding Installation Manual			
– Minimum temperature for engine starting	Refer to the corresponding Installation Manual			
Use of anti-icing additive for fuel temperature	*	≤4	≤minus 15	≤4

Note:

* - temperature value is specified in Installation Manual № X 319 N3 001 2

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Oil Temperature, [°C]:

Models	Arrius 2B2	Arrius 2K2	Arrius 2F	Arrius 2G1
Minimum for starting:				
– For oil with kinematic viscosity 5 mm ² /s and 3,9 mm ² /s	minus 30	minus 30	**	minus 30
– For oil with kinematic viscosity 3 mm ² /s	minus 50	minus 50	**	minus 50
Minimum oil temperature for power application:				
– For oil with kinematic viscosity 5 mm ² /s and 3,9 mm ² /s	10	10	10 (with 5 mm ² /s)	10
– For oil with kinematic viscosity 3 mm ² /s	0	0	0	0
Maximum	110	110	110	110

Note:

** - see the Installation Manual

Torque, [N×m]:

Model	Arrius 2B2	Arrius 2K2	Arrius 2F	Arrius 2G1
Maximum torque:				
Power rating:				
– 30 seconds OEI rating	905	—	—	—
– 2-minute OEI rating	905	—	—	—
– 2,5 minute OEI rating	—	830	—	830
– Continuous OEI rating	740	760	—	760
– Takeoff (5 minute)	740	760	650	760
– Maximum continuous	660	680	600	680
– Transient overtorque (< 20 sec)	—	961	752	961

Pressure Limits, [kPa]:

Oil pressure:				
– Maximum for starting	1000,0	1000,0	***	1000,0
– Transient during starting (2 min)	1500,0	1500,0	***	1500,0
Fuel pressure:				
– minimum	***	***	***	***
– maximum for in-flight starting (relative)	150,0	150,0	***	150,0

Note:

*** - see the Installation Manual.

Fuel grades and fuel additives:

Foreign grades	See the corresponding Installation Manual
Russian grades	– fuel grades: TC-1 (TS-1), PT (RT) (GOST 10277-86); – anti-icing additives: Fluid I (GOST 8313-88), Fluid I-M (TU 6-10-1458-79). Maximum concentration - 0,15% by volume, minimum concentration - 0,10% by volume.

Usable Oil:

Approved oil grades are specified in the corresponding Installation Manual.

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Aircraft Accessory Drives:

Accessory	Engine model	Rotation direction	Rotation speed [rpm]	Maximum continuous power, [kW]	Maximum torque at overload, [N-M]	Maximum overhung moment [N-M]	Share shaft breaking torque [N- m]
Starter Generator	Arrius 2F	CW	12334,0	5,7	25	25	77
	Arrius 2B2	CW	12334,0	—	25	25	95
	Arrius 2K2	CW	12335,0	—	25	7	95
	Arrius 2G1	CW	12335,0	—	25	7	95
Spare Drive	Arrius 2K2	CW	4632	—	15	11	45

Notes:

- Control system:
 - Single channel Electronic Engine Control Unit with manual back up - models Arrius 2B2, Arrius 2K2, Arrius 2G1;
 - Hydro mechanical with manual backup mode - model Arrius 2F;
 - The software for the Electronic Engine Control Unit (models Arrius 2B2/ 2K2/ 2G1) has been developed and tested in accordance with the provisions of Flight Critical category (level 1) of RTCA DO 178A;
 - Software version L11G000505 developed according to Midlife Efficiency Package (MEP) have been introduced for engine model Arrius 2B2.
- Operational capability of the Arrius 2 engine family (models Arrius 2B2/ 2K2/ 2F/ 2G1) in icing conditions was demonstrated by tests without the aircraft air inlet. Aircraft Designer shall demonstrate operational capability of the above engines in icing conditions with air inlet installation.
Helicopters models EC 120 (Arrius 2F), A109LUH (Arrius 2K2), EC 135 (Arrius 2B2) are «non icing certified rotorcraft», and in connection with that flights of the above mentioned helicopters under known icing conditions are prohibited.
- Protection of Arrius 2 engines (models Arrius 2B2/ 2K2/ 2F/ 2G1) against ingestion of foreign objects other than rain shall be provided by the helicopter Designer for installation of the above mentioned engines on the helicopter. Installation requirements of the engine Designer are specified in the Installation Manual.
- Air bleed (P3) for the aircraft use: Maximum permissible air bleed extraction:
 - 5,48% of engine inlet air mass flow (Arrius 2K2, Arrius 2G1);
 - 4,5% of engine inlet air mass flow (Arrius 2B2);
 - 70 g/sec – at takeoff rating on sea level (Arrius 2F);
 - 10 g/sec – maximum air bleed during starting (Arrius 2F).
- The Electronic Engine Control Unit must not be installed in a designated fire zone. The installation conditions are defined in the corresponding Installation Manual.
- The operation of the Arrius 2 engines (models Arrius 2B2/ 2K2/ 2G1) is restricted to multiengine helicopter application.
- The operation of the Arrius 2 engines (model Arrius 2F) is restricted to single engine helicopter application.

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*Original document in Russian language
signed by Mr. Mikhail Bulanov,
Deputy Director General of FATA*