

European Aviation Safety Agency

EASA TYPE-CERTIFICATE DATA SHEET

Number: E.029
Issue: 04
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Type: TURBOMECA
Arrius 2 series engines

Models

Arrius 2B1
Arrius 2B1A
Arrius 2B2
Arrius 2K1
Arrius 2K2
Arrius 2G1

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I. General

1. Type/Models: Arrius 2/ Arrius 2B (retained for reference purpose), Arrius 2B1, Arrius 2B1A, Arrius 2B2, Arrius 2K1, Arrius 2K2, Arrius 2G1.

2. Type Certificate Holder: TURBOMECA
64511 BORDES CEDEX FRANCE
DOA-ref: EASA.21J.070

3. Manufacturer: TURBOMECA

4. Certification Application Date/ EASA Certification Date :

Model	Application date	EASA Certification date	Type Certificate canceled
Arrius 2B	23 July 1993	28 May 1996	Cancelled 26 May 2000
Arrius 2B1	04 February 1997	05 September 1997	
Arrius 2B1A	03 February 1999	14 October 1999	
Arrius 2K1	14 April 1997	06 October 2000	
Arrius 2B2	13 February 2001	24 July 2002	
Arrius 2K2	28 August 2000	11 August 2003	
Arrius 2G1	19 June 2008	25 October 2011	

Note: EASA type certification for all these models is granted in accordance with article 2 paragraph 3(a) of EU Commission Regulation EC 1702/2003 based on the DGAC France certification of these products (French Type certificate N° M20).

II. Certification Basis

- Airworthiness requirements:** JAR-E Change 8 dated 4 May 1990 except Section 4, plus Orange Paper E:91/1 dated 27 May 1991, Orange Paper E/93/1 dated 17 May 1993. And, in addition:
For Arrius 2B and 2B1: NPA-E 17
Or for Arrius 2B1A and Arrius 2K1: Orange Paper E/96/1 dated 08 August 1996.
- Special condition:** JAR E Change 10 dated 15 August 1999 for Arrius 2B2, 2K2 and 2G1
None for Arrius 2B, 2B1, 2B1A, 2K1, 2K2 and 2G1
Special condition for certification of "30 seconds and 2 minutes rating" for Arrius 2B2.
- Deviation:** None for Arrius 2B/2B1/2B1A/2B2.
JAR E 570 (a)(4)(ii) and (a)(5)(ii) – Oil system for Arrius 2K1/2K2/2G1
- Equivalent Safety Finding:** JAR E 740 for Arrius 2B/2B1/2B1A/2B2.
JAR E740 (c) and JAR E 740 (f)(4)(i) for Arrius 2K1/2K2/2G1
- Environmental Standard:** Fuel venting provisions of ICAO Annex 16, Volume II, Part 2 (ed.2, dated 11/1993) for 2B1/2B1A/2B2/2K1/2K2.
ICAO Annex 16 to the Chicago Convention Volume II, Part II, Chapter 2 Amendment 5 as implemented in Decision No. 2003/3/RM of the Executive Director of the Agency dated 17 October 2003 (« CS-34 ») for the 2G1.

III. Technical Characteristics

1. Type Design Definition:

Arrius 2B1	P/N 0 319 00 703 0
Arrius 2B1A	P/N 0 319 00 710 0
Arrius 2B1A with TU45 ^(**)	P/N 0 319 00 711 0

Arrius 2B2	P/N 0 319 00 720 0
Arrius 2K1	P/N 0 319 00 610 0
Arrius 2K2	P/N 0 319 00 620 0
Arrius 2G1	P/N 0 319 00 633 0

(*): see note 11 paragraph VI

2. Description:

The Arrius 2 engine type is a 500 kW class turboshaft engine primarily intended for powering twin-engine helicopters.

The engine consists of an annular air intake, a centrifugal 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. The reduction gear unit also includes the accessory gear box driven by the gas generator and an oil tank. The fuel control system is ensured by a single channel Electronic Engine Control Unit (EECU) with manual back-up.

The ARRIUS 2B2 has a 30 second and a 2 minute OEI (One Engine Inoperative) rating structure.

6. Equipment:

Engine equipment is specified by the applicable Type Design Definition.

Starter-generator, Oil cooler and front mounts have to be supplied by the aircraft manufacturer.

7. Dimensions:

Model	Arrius 2B1, 2B1A, 2B2	Arrius 2K1, 2K2	Arrius 2G1
Overall Length	1.158	0.973	0.973
Overall Height	0.690	0.638	0.641
Overall Width	0.518	0.538	0.482

8. Dry Weight:

Model	Dry Weight (Kg)
Arrius 2B1, 2B1A, 2B2	114,3
Arrius 2K1, 2K2	112,8
Arrius 2G1	113.8

This includes the baseline engine equipments and the EECU. For additional specific equipments refer to the Installation/Operating manual.

6. Ratings:

Ratings kW	2B1	2B1A	2B1A with TU45 ^(*)	2B2	2K1	2K2	2G1
30 seconds OEI	NA	NA	NA	557	NA	NA	NA
2 minutes OEI	NA	NA	NA	544	NA	NA	NA
2 – ½ minute OEI	430	491	526	N/A	504	504	518.4
Continuous OEI	430	457	371	485	504	504	477
Takeoff	430	457	371	480	504	504	426
Maximum continuous	408	408	309	432	432	453	426

The performance values specified above correspond to minimum values defined under the following conditions:

- ISA conditions at sea level, on test bed
- engine equipped with a test bed exhaust pipe and test bed intake
- no intake or exhaust losses
- no installation loss
- no air bleed
- no power drawn by any accessories other than those required for normal engine operation

Output shaft rotation speed:

- 5898 rpm (100%) constant for Arrius 2B1/2B1A with or without TU 45.
- 6252 rpm (106%) constant for 2B2 model
- 6360 rpm (106%) constant for 2K1 and 2K2 model
- 6000 rpm (100%) constant for Arrius 2G1 model
- fuel Low Heat Value: 43 136 kJ/kg

(*): see note 11 paragraph VI

7. Control System:

The control system is a single channel Electronic Engine Control Unit with manual back up.

The software standard is specified in the engine Type Design Definition.

Refer to the Installation / Operating Manuals for further information.

8. Fluids (Fuel, Oil, additives)

Refer to applicable Installation / Operating Manuals.

9. Aircraft Accessory Drives:

	Rotation direction	Rotation speed (rpm)	Maximum torque at overload (N.m)	Maximum static overhung moment (N.m)	Shear shaft breaking torque N.m
Starter Generator					
2B1 / 2B1A / 2B2	CW	12 334	25	25	95
2K1	CW	12 335	25	7	95
2K2	CW	12 335	25	7	95
2G1	CW	12 335	25	7	95
Spare drive					
2K1	CW	4632	15	11	45
2K2	CW	4632	15	11	45

Notes:

- CW: clockwise
- The rotation direction of the power drives for the accessories is indicated considering the power drive seen from the outside.

10. Maximum Permissible Air Bleed Extraction:

2B1 / 2B1A / 2B2: Maximum permissible air bleed for aircraft use: 4.5% of engine inlet air mass flow.

2K1 / 2K2 / 2G1: Maximum permissible air bleed for aircraft use: 5.48% of engine inlet air mass flow.

IV. Operating Limitations:

1. Operating/starting/relight envelope

Refer to Installation / Operating Manual

2. Temperature Limits

2.1. Turbine Gas Temperature (°C)

	2B1	2B1A	2B2	2K1	2K2	2G1
30 seconds OEI rating	NA	NA	1024	NA	NA	NA
2 minute OEI rating	NA	NA	994	NA	NA	NA
2-1/2 minute OEI rating	945	945	N/A	957	990	990
Continuous OEI rating	895	895	942	905	934	938
Take off	895	895	897	905	929	932
Maximum continuous	855	855	879	866	882	887
Starting (unlimited)	810	810	819	810	819	819
Starting (limited to 5 sec.)	895	895	910	(1)	(2)	(2)

(1)) 855 with no failure indication; 895 with P0 or T1 failure indication

(2)) 867 with no failure indication; 910 with P0 or T1 failure indication

Refer to Installation Manual for required action if limits are exceeded.

2.2 Fuel temperature

Refer to Installation / Operating Manuals

2.3 Oil temperature (°C)

Refer to Installation / Operating Manuals

3. Pressure Limits

3.1 Fuel pressure

See installation / Operating Manuals

3.2 Oil pressure

- Minimum
 - Flight 170 kPa for $N1 \geq 68\%$ for Arrius 2B1/2B1A
 - 130 kPa for $N1 \geq 60\%$ for Arrius 2B2
 - See Installation/ Operating Manual for Arrius 2K1/2K2/2G1.
- Maximum Starting 1000 kPa
- Transient during starting (2 min) 1500 kPa
- see Installation/ Operating Manual

4. Maximum / Minimum Permissible Rotor Speeds

4.1. Gas generator speed (N1):

Power rating	2B1		2B1A		2B2	
	rpm	%	rpm	%	rpm	%
30 seconds OEI rating	N/A	N/A	N/A	N/A	57081	105.5
2-minute OEI rating	N/A	N/A	N/A	N/A	56413	104.2
2-1/2 minute OEI rating	56113	103.7	56113	103.7	N/A	N/A
Continuous OEI rating	54706	101.1	54706	101.1	55187	102.0
Takeoff	54706	101.1	54706	101.1	54105	99.9
Maximum continuous	53406	98.7	53406	98.7	53564	98.9
Transient overspeed (<5sec)	56823	105	56823	105	55187	102

Power rating	2K1		2K2		2G1	
	rpm	%	rpm	%	rpm	%
2-1/2 minute OEI rating	56113	103.7	56331	104.1	56409	104.2
Continuous OEI rating	54706	101.1	55006	101.6	55094	101.8
Takeoff	54706	101.1	55006	101.6	55094	101.8
Maximum continuous	53406	98.7	53706	99.2	53795	99.4
Transient overspeed (<5sec)	56823	105	57689	106.6	57689	106.6

With 100%= 54117 rpm

Notes:

- Minimum stabilised speed:
 - 35176rpm (65%) for Arrius 2B1, 2B1A and
 - 32470 rpm (60%) for Arrius 2B2, 2K1, 2K2 and 2G1

4.2. Power turbine speed (N2) (%):

Limit values authorised other than during starting and idle (FLIGHT mode):

	2B1/ 2B1A/ 2B2	2K1 / 2K2 / 2G1
Maximum for an unlimited duration	46 680 (106%)	46 650 (106%)
Maximum transient 20 sec.	47 560 (108%)	49 290 (112%)
Minimum for an unlimited duration	41 396 (94%)	39 608 (90%)
Minimum transient 20 sec.	37 430 (85%)	37 408 (85%)

2B1/ 2B1A/ 2B2: With 100%= 44 038 rpm.

2K1/2K2/2G1 With 100%= 44 009 rpm

5. Torque Limits (N.m)

Power rating	2B1	2B1A	2B1A with TU45 ^(*)	2B2	2K1 / 2K2 / 2G1
30 seconds OEI rating	N/A	N/A	N/A	905	N/A
2-minute OEI rating	N/A	N/A	N/A	905	N/A
2-1/2 minute OEI rating	790	795	852	N/A	830
Continuous OEI rating	740	740	600	740	760
Takeoff	740	740	600	740	760
Maximum continuous	660	660	500	660	680
Transient overtorque (<20 sec.)	830	830	905	N/A	961

(*): see note 11 paragraph VI

6. Installation Assumptions:

Refer to Installation / Operating Manuals for details.

7. Time Limit Dispatch:

All engine systems and equipment must be functional prior to aircraft take-off. Any engine system or equipment failure which would occur in flight shall be replaced or repaired prior to commencement of next flight

V. Operating and Service Instructions:

	2B1	2B1A	2B2
Installation Manual	X 319 L5 001 2	X 319 L5 001 2	X 319 N3 001 2
Maintenance Manual	X 319 L5 301 2	X 319 L5 451 2	X 319 N3 451 2
Overhaul Manual	X 319 L5 500 2	X 319 L5 500 2	X319 N3 500 2

	2K1	2K2	2G1
Installation Manual	X 319 N1 004 2	X 319 N0 0012	X 319 R4 002 2
Maintenance Manual	X 319 N1 300 2	X 319 N0 452 2	X 319 R4 450 2
Overhaul Manual	X 319 N1 500 2	X 319 N0 500 2	X 319 R4 500 2

VI. Notes

1. The operation of the Arrius 2B1, 2B1A 2B2 2K1 2K2 and 2G1 engines are restricted to multi-engine helicopter applications.
2. The engine is approved to be fitted to rotorcraft only where the installation precludes ingestion of foreign objects (as defined in JAR-E 790(c) and JAR-E 800) from entering the engine inlet.
3. The Arrius 2B1, 2B1A 2B2 2K1 2K2 and 2G1 engines (without the aircraft air inlet) meet the JAR requirement for operation in icing conditions within the envelope defined in JAR 29 Appendix C.
4. The electronic control system provides a "TRAINING" function for training crews in an engine failure condition. See the Installation/Operating Manual for the characteristics of this function.
5. The Electronic Engine Control Unit must not be installed in a designated fire zone. The installation conditions are defined in the Installation/Operating Manual.
6. The software for the Electronic Engine Control Unit has been developed and tested in accordance with the provisions of Flight Critical category (level 1) of RTCA DO 178A.
7. Lightning protection requirements and electromagnetic interference are specified in the Installation/Operating Manual.
8. The EASA approved Airworthiness Limitations Section of the Instructions for Continued Airworthiness is published in the applicable "Engine Maintenance Manual" document, chapter 5 "Airworthiness Limitations".

9. The acceptance limitations are defined in the Acceptance Test Procedure n° 0.319.00.958.0 at the latest issue for Arrius 2B1 and 2B1A, 0 319 00 967 0 at the latest issue for Arrius 2B2, 0.319.00.962.0 at the latest issue for Arrius 2K1, 0.319.00.965.0 at the latest issue for the Arrius 2K2 and AA049873 at the latest issue for the Arrius 2G1.
10. The Arrius 2B engine model has been cancelled by the DGAC following Turboméca request.
11. TU45C is a major non-significant software modification which mainly increases Arrius 2B1A 2½ minute OEI Power rating and reduces the other power ratings. When modification TU45C is applied on Arrius 2B1A, it is identified as "Arrius 2B1A_1" on engine identification plate and its reference became: 0319007110.
12. Conversion from non civil use:
This note is applicable to the ARRIUS 2B1 - 2B1A (post TU 45C) - 2B2 - 2K1 - 2K2 engines originally assembled by TURBOMECA and previously operated by an operator not under the control of a Civil Authority (military, paramilitary, etc.).
The compliance of such engines with the European rules enabling issuance of an aircraft standard certificate of airworthiness must be checked. Their configuration, including design changes and repairs, does not necessarily conform to the type definition approved by EASA, and it is possible that in operation they have exceeded the limits approved by EASA. Before a standard certificate of airworthiness is issued to an aircraft in which such engines are installed, an EASA Form 1 must be issued for these engines. This requires incorporation of Turboméca Mandatory Service Bulletin A319 72 2844.
