TYPE-CERTIFICATE DATA SHEET

No. E.080

for
ARRIUS 1 series engines

Type Certificate Holder

Safran Helicopter Engines

64510 Bordes
France

For Models:

Arrius 1A
Arrius 1A1

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I. General

1. Type / Model :

Arrius 1 / Arrius 1A, Arrius 1A1, for twin-engines helicopters.

2. Type Certificate Holder:

Safran Helicopter Engines
64510 Bordes
Frankce
DOA-ref: EASA.21J.070

Until 18 July 2016 Turbomeca
After 18 July 2016 Safran Helicopter Engines

3. Manufacturer:

Until 18 July 2016 Turbomeca
After 18 July 2016 Safran Helicopter Engines

4. Certification Application Date :

Arrius 1A : 5 October 1983
Arrius 1A1 : 17 February 2005

5. EASA Certification Reference Date:

30 June 1985

6. EASA Certification Date:

Arrius 1A : 29 February 1988
Arrius 1A1 : 15 December 2006

Note: EASA type certification for Arrius 1A model is granted in accordance with article 2 paragraph 3(a) of EU Commission Regulation EC 1702/2003 based on the DGAC France certification of this product.

II. Certification Basis

1. Airworthiness requirements:

JAR-E Change 6 dated 28/08/81, Section 1,2,4 (based on BCAR C issue 13: chap. C1-1, C1-2, C4-1, C4-2, C4-3, C4-6, C4-7) plus Blue Paper N°791 and 798 as per letter from DGAC, French Civil Aviation Authority, ref 53792 SFACT/TC dated 30/07/84 and 53118 SFACT/TC dated 05/02/88.

For Arrius 1A1 in addition:
CS-E 20(a): Engine configuration and interface

2 Environmental Standard:

Environmental protection as per 21 A.18(b) of regulation (EC) 1702/2003

III. Technical Characteristics

1. Type Design Definition:

Arrius 1A	P/N 0 319 00 513 0
Arrius 1A1	P/N 0 319 00 530 0

2. Description:

The Arrius 1A and 1A1 engines are free-turbine turboshaft engines of the 350 kW category. Arrius 1 engine consists of an annular air intake, a centrifugal compressor driven by a single-stage turbine, a reverse flow annular combustion chamber, a single stage free turbine with a through-shaft which drives a reduction gear assembly located at the front, and an exhaust pipe. The reduction gear unit casing also includes the accessory gearbox driven by the gas generator. The control system features an engine electronic control unit (EECU), with a manual back-up
Starter-generator is not part of the engine type definition.

3. Equipment:

Engine equipment is specified by the applicable Type Design Definition

4. Dimensions:

Model	Length (m)		Height (m)	Width (m)
	with exhaust pipe	without exhaust pipe		
Arrius 1A(*) / 1A1	1.601	0.793	0.586	0.436

(*) With TU14 design change embodied

5. Dry Weight:

Model	Dry Weight (Kg)
Arrius 1A/1A1	102.7

6. Ratings:

Ratings kW	Arrius 1A	Arrius 1A1
2 – ½ minute OEI	388	415
30 min / Continuous OEI	357	386
Takeoff	340	343
Maximum continuous	296	305

Note 1: Engine ratings correspond to minimum values defined under the following conditions:

- static, sea level standard conditions (15ºC, 1013 hPa)
- engines equipped with calibrated test bed air intake bellmouth P/N 6.203.13 726 0
- engines equipped with calibrated test bed air intakecasing P/N 6.203.18.725.0
- use of exhaust pipeP/N 0.319.77.759.0
- no air bleed,
- no power drawn by any accessories other than those required for engine operation.
- fuel Low Heat Value : 43 136 kJ/kg
- output shaft rotation speed : 6016 rpm (100%)

Note 2: Detailed performance curves are provided in the relevant Installation / Operating Manuals.

7. Control System:

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

Refer to the Installation / Operating Manuals for further information.

8. Fluids (Fuel, Oil, additives)

Refer to applicable Installation / Operating Manuals.

9. Aircraft Accessory Drives:

Designation	Rotation direction Facing pad	Rotation speed	Maximum Steady state	Maximum torque at overload	Maximum static overhung moment
		(rpm)	(kW)	(daN.m)	(daN.m)
Starter Generator	CCW	11479	(*)	25	25

(*) Maximum Steady state mechanical off-take:

- Arrius 1A:
  - 4.8 kW at all ratings
- Arrius 1A1:
  - AEO rating (Max Continuous, Take off): 3 kW without de-rating
    If mechanical off-take is comprised between 3 kW and 6 kW, corrections to performance and ratings stated in Performance Booklet X 319 U1 100 2 shall be applied, and it shall be limited to 4.8 kW if altitude is higher than 10000 ft.Continuous OEI rating: 4.8 kW without de-rating
    If mechanical off-take is comprised between 4.8 kW and 6 kW, corrections to performance and ratings stated in Performance Booklet X 319 U1 100 2 shall be applied, and it shall be limited to 4.8 kW if altitude is higher than 10000 ft.
  - 2 ½ min OEI rating: 6 kW without de-rating, and limited to 4.8 kW if altitude is higher than 10000 ft.

Notes:

- CCW : counter 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:

P3 air bleed for helicopter use, maximum flow rate at standard sea level conditions: 70 g/s at Take-off rating
For further details, see Installation Manual.

IV. Operating Limitations:

1. Temperature Limits

1.1 Turbine Gas Temperature (°C)

	1A	1A1
2-1/2 minute OEI rating	870	886
30 minute / Continuous OEI rating	800	812
Take off	800	773
Maximum continuous	765	749
Starting (unlimited)	765	765
Starting (limited to 5 sec.)	870	870

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

1.2 Fuel temperature

Refer to relevant Installation / Operating Manuals

1.3 Oil temperature (°C)

- Minimum for starting: between –50°C and –30°C for ARRIUS 1A, -40°C and -30ºC for ARRIUS 1A1, , according to oil specification. Refer to Installation Manual.
- Minimum for power application: 0°C with 3 cst oils
  10ºC with 5 cst oil.
- Maximum operating temperature: 80°C to 110°C depending on altitude and type of fuel. Refer to Installation Manual.

2. Pressure Limits

2.1 Fuel pressure

See installation / Operating Manuals

2.2 Oil pressure (hPa)

- Maximum: 1MPa
- Minimum : 170kPa at N1 greater than 65%

3. Maximum / Minimum Permissible Rotor Speeds

3.1. Gas generator speed (N1):

Power rating	1A		1A1	
	rpm	%	rpm	%
2-1/2 minute OEI rating	56140	103.7	56347	104.1
30 minute / Continuous OEI rating	55300	102.2	55452	102.5
Takeoff	54685	101	54375	100.5
Maximum continuous	53285	98.5	53397	98.7
Transient overspeed (<5sec)	56280	104	56498	104.4

With 100%= 54117 rpm

Notes:

- Minimum stabilised speed: 35176rpm (65%).
- Refer to Installation Manual for required action if limits are exceeded

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

Maximum stabilized	104
Maximum transient 5 sec.	108
Minimum stabilized	91
Minimum transient 5 sec.	83

With 100%= 45438 rpm corresponding to 6016 rpm at power off/take.

Notes:

- Minimum stabilised ground iddle speed: 40000 rpm (88%).
- During starting, continuing operation within the 70 to 85% range is prohibited.
- Refer to Installation Manual for required action if limits are exceeded

4. Torque Limits (daNm)

Power rating	1A/1A1
2-1/2 minute OEI rating	68
30 minute /Continuous OEI rating	63
Takeoff	63
Maximum continuous	56
Transient overtorque (<20 sec.)	77

5. Installation Assumptions:

Refer to Installation / Operating Manuals for details.

6. Dispatch Limitations:

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:

	1A	1A1
Installation Manual	X 319 D6 001 2	
Maintenance Manual	X 319 D 6300 1	X 319 U1 451 2
Overhaul Manual	X 319 H6 5002	(*)

(*) Overhaul must be done by SAFRAN HELICOPTER ENGINES until the Overhaul Manual is published.

VI. Notes

Ingestion of foreign matter:

The Arrius engines were not tested to evaluate the effects of foreign object ingestion. It is the Airframer's responsibility to protect the engine from foreign object ingestion through the design of the aircraft air intake. The aircraft manufacturer must substantiate that the aircraft installation prevents foreign object ingestion by the engine, prior to the approval of the engine installation.

The Arrius engines do not have anti-icing provisions. They comply with the engine airworthiness requirements during icing conditions when aircraft air intake Part Number 355 A 543533 is installed.

1. EECU box

- Installation conditions:
  - The box shall be installed in the airframe outside the fire zone.
  - Refer to Installation Manual for others installation conditions.
- Lightning protection: refer to Installation Manual
- Electromagnetic interferences: tests carried out are specified in the Installation Manual.
- Software: The software has been developed and tested and the corresponding documentation developed according to the recommendations of document RTCA DO 178A/EUROCAE ED-12A to level 1.

Vibrations:

A probe can be mounted on the turbine case bracket: see Installation Manual.

2. Overspeed

The engine has an electronic free turbine overspeed system limitation.

3. "Training" function

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.

4. **Variant** 1A was previously defined for certification purposes on DGAC F Engine Type Certificate and Type Certificate Data Sheet M-16 prior to being superseded by the EASA Type Certificate and Type Certificate Data Sheet.

5. Return to civil use

An Arrius 1A/1A1 engine coming from a user not controlled by a civil authority can be converted in an Arrius 1A for civil use. 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. The Arrius 1A is known to be installed on the EC355. Before a standard certificate of airworthiness is issued to an aircraft in which a converted Arrius 1A turboshaft engine is installed, an EASA Form 1 must be issued for the engine. This requires incorporation of SAFRAN HELICOPTER ENGINES Mandatory Service Bulletin A319 72 0802.

SECTION: ADMINISTRATIVE

I. Acronyms and Abbreviations

n/a

II. Type Certificate Holder Record

Until 18 July 2016 Turbomeca
After 18 July 2016 Safran Helicopter Engines

III. Change Record

Issue	Date	Changes	TC issue
Issue 01	15 December 2006	Initial Issue	Initial Issue, 15 December 2006
Issue 02	13 May 2008	Return to Civil Use	Initial issue
Issue 03	01 August 2016	Name change from Turbomeca to Safran Helicopter Engines	01 August 2016

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