TYPE-CERTIFICATE
DATA SHEET

No. E. 103
Issue 2

for
ARDIDEN 3 series engines

Type Certificate Holder

Safran Helicopter Engines

Avenue Joseph Szydlowski
64510 Bordes
France

For Models:
ARDIDEN 3G
ARDIEN 3C

Intentionally left blank

TABLE OF CONTENTS

I. General 4
1. Type/Models: 4
2. Type Certificate Holder: 4
3. Manufacturer: 4
4. Certification Application Date: 4
5. EASA Certification Reference Date: 4
6. EASA Certification Date: 4
II. Certification Basis 5
1. Certification Specifications: 5
2. Special Conditions: 5
3. Deviations: 5
4. Equivalent Safety Findings: 5
5. Environmental Protection Requirements: 5
III. Technical Characteristics 6
1. Type Design Definition: 6
2. Description: 6
3. Equipment: 6
4. Dimensions: 6
5. Dry Weight: 6
6. Ratings: 6
6.1 All Engines Operative (kW) 6
6.2 One Engine Inoperative (kW) 7
7. Control System: 7
8. Fluids (Fuel/Oil/Additives): 7
9. Aircraft Accessory Drives: 8
10. Bleed Extraction: 8
IV. Operational Limitations 9
1. Temperature limits 9
1.1 Gas generator exhaust temperature (T45) limits 9
1.2 Fuel temperature (Engine inlet) 9
1.3 Oil temperature 10
2. Maximum / Minimum Speeds: 10
2.1 Gas generator speed (N1) 10
2.2 Power turbine speed (N2) 11
3. Torque Limits: 11
4. Pressure Limits: 12
4.1 Oil pressure 12
4.2 Fuel pressure (Engine inlet) 12
5. Installation Assumptions: 12
6. Time Limited Dispatch: 12
V. Operational and Service Instructions 13
VI. Notes 14
SECTION: ADMINISTRATIVE 15
I. Acronyms and Abbreviations 15
II. Type Certificate Holder Record 15
III. Change Record 15

I. General

1. Type/Models:

ARDIDEN 3 Series/ARDIDEN 3G, ARDIDEN 3C. These models are approved for use on multi-engined civil rotorcraft at the ratings and within the operating limitations specified below, subject to compliance with the powerplant installation requirements appropriate to approved installations.

2. Type Certificate Holder:

Safran Helicopter Engines
64510 Bordes
France

DOA reference: EASA.21J.070

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

3. Manufacturer:

Safran Helicopter Engines

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

4. Certification Application Date:

ARDIDEN 3G	11 September 2007
ARDIDEN 3C	18 January 2010

5. EASA Certification Reference Date:

11 March 2015

6. EASA Certification Date:

ARDIDEN 3G	12 June 2017
ARDIDEN 3C	05 April 2018

II. Certification Basis

1. Certification Specifications:

CS-E Amendment 3, effective 23 December 2010

2. Special Conditions:

SC1 – Special Condition for certification of a HIP (Hovering at Increased Power) rating.
SC2 – Special Condition for Transient over-temperature, over-speed and over-torque limit approval.
SC3 – Special Condition for non-declaration of approved life for engine mounts.

3. Deviations:

None

4. Equivalent Safety Findings:

None

5. Environmental Protection Requirements:

Fuel venting per ICAO Annex 16, Volume II, Part II, Chapter 2, Amendment 7, dated 17 November 2011.

III. Technical Characteristics

1. Type Design Definition:

ARDIDEN 3G	P/N 0465001000
ARDIDEN 3C	P/N 0465005010

2. Description:

The ARDIDEN 3 series turboshaft engines have an annular inlet, a two-stage centrifugal compressor driven by a single-stage high pressure turbine, a reverse flow combustion chamber and a two-stage low pressure turbine driving the output shaft. The high pressure (gas generator) shaft drives the accessory gearbox. The engines are controlled by a Full Authority Digital Electronic Control (FADEC).

3. Equipment:

The equipment necessary to operate the engine and that is not included in the Engine Type Design Definition is defined in the applicable Installation and Operating Manual.

4. Dimensions:

	Length (mm)	Height (mm)	Width (mm)
ARDIDEN 3G	1244	648	640
ARDIDEN 3C	1285.4	648	655.9

5. Dry Weight:

	Weight (completely equipped) (kg)
ARDIDEN 3G	215
ARDIDEN 3C	226.6

6. Ratings:

6.1 All Engines Operative (kW)

	Maximum Continuous	Take-off (5 minutes)	30-minute AEO
ARDIDEN 3G[(1)(2)(3)(4)]	913	1177	1177
ARDIDEN 3C[(1)(2)(3)(4)]	902	968	968

6.2 One Engine Inoperative (kW)

	Continuous OEI	2½-minute OEI	2-minute OEI	30-second OEI
ARDIDEN 3G(1)(2)(3)(4)	1124	1198	n/a	n/a
ARDIDEN 3C(1)(2)(3)(4)	986	n/a	1132	1273

(1) The performance values specified above correspond to minimum values defined under the following conditions:
- ISA conditions at Sea Level;
- With no mechanical off-take, other than those required for Engine operation;
- No customer bleed flow;
- Fuel Low Heat Value: 43 136 kJ/kg;
- No installation losses;
- Test bed air inlet P/N 6.528.30.543.0 (ARDIDEN 3G);
- Test bed air inlet P/N 6.528.30.522.0 or P/N 6.528.30.543.0 (ARDIDEN 3C);
- Test bed exhaust duct P/N 6.528.30.538.0;
- Output shaft rotation speed: 21 000 rpm (20160 rpm for ARDIDEN 3C OEI ratings)

(2) In the conditions specified in (1), the performance values specified for OEI ratings are limited by torque toppings embedded in the EECU to protect the helicopter main gearbox .The performance values specified for AEO ratings are limited by the mechanical limits corresponding to the torque limits validated for the engine.

(3) In conditions other than ISA SLS, power is limited either by thermal (N1, T45) or mechanical (Torque) limits, whichever is reached first. For ARDIDEN 3G, EECU Torque limits are function of N2 (refer to the applicable Installation and Operating Manual).

(4) For detailed performance curves, refer to the applicable Installation and Operating Manual.

7. Control System:

ARDIDEN 3G	Dual channel electronic engine control system Electronic Control Unit (ECU) P/N 70PMB01000 or later approved standard (software standard included in the ECU P/N)
ARDIDEN 3C	Dual channel electronic engine control system Electronic Control Unit (ECU) P/N 70PMC01000 or later approved standard (software standard included in the ECU P/N)

8. Fluids (Fuel/Oil/Additives):

Refer to the applicable Installation and Operating Manual.

9. Aircraft Accessory Drives:

	Rotation direction	Rotation Speed	Maximum Torque in overload condition	Maximum static cantilever	Maximum unbalance (ISO 1940)	Shear shaft maximum breakaway torque	Maximum Continuous shaft power (1)	
							Idle, AEO and OEI continuous	2½-min OEI (ARDIDEN 3G) 2-min and 30-sec OEI (ARDIDEN 3C)
		rpm	daNm	daNm	G	daN.m	kW	kW
Starter (ARDIDEN 3G only)	Anti-CW	12031 (100% N1)	9	3.8	2.5	22.5	n/a	n/a
Starter-Generator (ARDIDEN 3G and 3C)	Anti-CW	12031 (100% N1)	9	3.8	2.5	22.5	12.9	12.9

(1) If the helicopter manufacturer uses a starter-generator, transient mechanical offtake is allowed up to 150% (19.3 kW) for 2 minutes and up to 200% (25.7 kW) for 5 seconds.

10. Bleed Extraction:

The P3 air bleed extraction for helicopter use is limited by the section of the P3 extraction restrictor. The maximum possible extraction is 150 g/s and corresponds to Take-Off power at ISA SLS conditions.

Refer to the applicable Installation and Operating Manual for further details.

IV. Operational Limitations

1. Temperature limits

1.1 Gas generator exhaust temperature (T45) limits

On start-up:

	For an unlimited duration	Maximum overtemperature (< 10 s)
ARDIDEN 3G	800°C	860°C
ARDIDEN 3C	800°C	860°C

In flight, All Engine Operative:

	Take-off (5 minutes)	30-minute AEO	Maximum Continuous	AEO transient (20 seconds)
ARDIDEN 3G (1)	923°C	923°C	870°C	936°C
ARDIDEN 3C	914°C	914°C	880°C	923°C

(1) A Maximum Inadvertent Overtemperature of 958°C has been certified for the ARDIDEN 3G model. This means the maximum T45 temperature in AEO conditions for which inadvertent occurrence of up to 20 seconds has been agreed not to require rejection of the engine from service or maintenance action (other than to correct the cause).

In flight, One Engine Inoperative:

	30-second OEI	2-minute OEI	2½-minute OEI	Continuous OEI
ARDIDEN 3G	n/a	n/a	958°C	923°C
ARDIDEN 3C	968°C	946°C	n/a	924°C

1.2 Fuel temperature (Engine inlet)

		Minimum fuel temperature	Maximum fuel temperature
ARDIDEN 3G (2)	Normal Fuels (1)	The highest temperature between -40°C and the temperature corresponding to a kinematic viscosity of 12 cSt	+55°C
	Alternative Fuels (1)	The highest temperature between -50°C and the temperature corresponding to a kinematic viscosity of 12 cSt	+25°C
ARDIDEN 3C (3)	Normal Fuels (1)	The highest temperature between -40°C and the temperature corresponding to a kinematic viscosity of 12 cSt	+55°C
	Alternative Fuels (1)	The highest temperature between -40°C and the temperature corresponding to a kinematic viscosity of 12 cSt	+25°C

(1) Refer to the applicable Installation and Operating Manual.
(2) For the ARDIDEN 3G model, the minimum fuel temperature is subject, for certain fuels, to mandatory use of anti-icing additive for temperatures below -20°C. Refer to the applicable Installation and Operating Manual for further details.
(3) For the ARDIDEN 3C model, the minimum fuel temperature is subject, for certain fuels, to mandatory use of anti-icing additive for temperatures below -10°C. Refer to the applicable Installation and Operating Manual for further details.

1.3 Oil temperature

	Minimum oil temperature for starting	Minimum oil temperature before applying power	Maximum oil temperature
ARDIDEN 3G and ARDIDEN 3C	-30°C for 5 cSt -40°C for 3 cSt	Depends on use of anti-icing additive in fuel. Refer to the applicable Installation and Operating Manual.	135°C

2. Maximum / Minimum Speeds:

2.1 Gas generator speed (N1)

100% N1 = 37 506 rpm

In-flight minimum speeds:

	IDLE mode	IDLE with PT locked	FLIGHT mode
ARDIDEN 3G	51.3%	60.6%	60.8%
ARDIDEN 3C	51.9%	n/a	60.2%

In-flight maximum speeds, All Engine Operative:

	Take-off (5 minutes)	30-minute AEO	Maximum Continuous	AEO transient (20 seconds)
ARDIDEN 3G (1)	103.3%	103.3%	100.5%	104%
ARDIDEN 3C	101.9%	101.9%	99.9%	102.9%

(1) A Maximum Inadvertent Overspeed of 105.8% has been certified for the ARDIDEN 3G model. This means the maximum N1 speed in AEO conditions for which inadvertent occurrence of up to 20 seconds has been agreed not to require rejection of the engine from service or maintenance action (other than to correct the cause).

In-flight maximum speeds, One Engine Inoperative:

	30-second OEI	2-minute OEI	2½-minute OEI	Continuous OEI
ARDIDEN 3G	n/a	n/a	105.8%	103.3%
ARDIDEN 3C	105.9%	103.6%	n/a	102.7%

2.2 Power turbine speed (N2)

100% N2 = 21 000 rpm

In-flight minimum speeds:

	Stabilised	Transient (20 seconds)
ARDIDEN 3G	90%	80%
ARDIDEN 3C	95%	85%

In-flight maximum speeds:

	Stabilised	Transient
ARDIDEN 3G (1)	107%	113% (4 seconds)
ARDIDEN 3C (1)	107%	113% (20 seconds)

(1) A Maximum Inadvertent Overspeed of 113% has been certified for the ARDIDEN 3G model and 117% for the ARDIDEN 3C model. This means the maximum N2 speed for which inadvertent occurrence of up to 20 seconds has been agreed not to require rejection of the engine from service or maintenance action (other than to correct the cause).

For the ARDIDEN 3G model, operation between 63% and 73% is limited to 20 seconds.
For the ARDIDEN 3C model, operation between 50% and 73% is limited to 20 seconds.

3. Torque Limits:

Maximum torque, All Engine Operative:

	Take-off (5 minutes)	30-minute AEO	Maximum Continuous	AEO transient (20 seconds)
ARDIDEN 3G (1)	535 Nm	535 Nm	415 Nm	600 Nm
ARDIDEN 3C	460 Nm	460 N.m	430 Nm	505 Nm

(1) A Maximum Inadvertent Overtorque of 698 Nm has been certified for the ARDIDEN 3G model. This means the maximum torque in AEO conditions for which inadvertent occurrence of up to 20 seconds has been agreed not to require rejection of the engine from service or maintenance action (other than to correct the cause).

Maximum torque, One Engine Inoperative:

	30-second OEI	2-minute OEI	2½-minute OEI	Continuous OEI	OEI transient (10 seconds)
ARDIDEN 3G (2)	n/a	n/a	552 (1) Nm	519 (1) Nm	675 Nm
ARDIDEN 3C	614 (1) Nm	546 (1) Nm	n/a	477 (1) Nm	776 Nm

(1) The maximum torque value specified are limited by torque limits embedded in the EECU to protect the helicopter main gearbox (ISA SLS).
(2) Torque limits are function of N2 speed and are given for 100% N2 (refer to Installation and Operation Manual).

4. Pressure Limits:

4.1 Oil pressure

For the ARDIDEN 3G and ARDIDEN 3C models, normal oil absolute pressure for engine operation is between 250 kPa and and 900 kPa.

Minimum and Maximum levels are functions of N1 and oil temperature. Refer the applicable Installation and Operating Manual.

4.2 Fuel pressure (Engine inlet)

		Minimum fuel pressure, other than engine start	Minimum fuel pressure, start / restart	Maximum fuel pressure in operation	Maximum fuel pressure, engine stopped
ARDIDEN 3G and ARDIDEN 3C	Normal Fuels (1)	For oil temperature below 120°C, highest of 15 kPa (absolute) and 35 % of atmospheric pressure. For oil temperature between 120°C and 135°C, highest of 26 kPa (absolute) and 37 % of atmospheric pressure.	25 kPa (relative)	150 kPa (relative)	200 kPa (relative)
	Alternative Fuels (1)	21 kPa (relative)	25 kPa (relative)	150 kPa (relative)	200 kPa (relative)

(1) Refer to the applicable Installation and Operating Manual.

5. Installation Assumptions:

Refer to the applicable Installation and Operating Manual.

6. Time Limited Dispatch:

ARDIDEN 3G and ARDIDEN 3C models are not approved for time limited dispatch.

V. Operational and Service Instructions

Manuals	Installation and Operating Manual	Performance Brochure
ARDIDEN 3G	X 465 C5 001 2	X 465 C5 003 2
ARDIDEN 3C	X 465 C9 001 2	X 465 C9 002 2

Instructions for Continued Airworthiness	Maintenance Manual	Overhaul Manual	Service Letters and Service Bulletins
ARDIDEN 3G	X 465 C5 300 2	X 465 C5 500 2	refer to the SB and SL directory
ARDIDEN 3C	X 465 C9 300 2	X 465 C9 500 2	

VI. Notes

1. The ARDIDEN 3G and ARDIDEN 3C models, equipped with their respective air intake protective grid, are certified in “Engine stand alone” configuration according to CS-E 780 for satisfactory operation in continued icing conditions.

2. The ARDIDEN 3G and ARDIDEN 3C models are not certified for hail and bird ingestion.

3. Helicopter requirements for protection of the ARDIDEN 3G and ARDIDEN 3C models against foreign object (including bird), water, snow, hail and ice ingestion are defined in the applicable Installation and Operating Manual.

4. The ARDIDEN 3G and ARDIDEN 3C EECU shall be installed outside of a designated fire zone and outside of a zone that might lead to overheat conditions. Corresponding installation assumptions are defined in the applicable Installation and Operating Manual.

5. The ARDIDEN 3G and ARDIDEN 3C EECU features an OEI TRAINING mode for training crews in the event of engine failure. Refer to the applicable Installation and Operating Manual for additional details.

6. The ARDIDEN 3G and ARDIDEN 3C EECU software has been validated in accordance with the requirements of RTCA/DO-178B, Level 1.

7. The operating / starting / relight envelopes of the ARDIDEN 3G and ARDIDEN 3C models are provided in the applicable Installation and Operating Manual.

8. Qualified environmental conditions of the ARDIDEN 3G and ARDIDEN 3C EECU, including EMI and HIRF, are detailed in the applicable Installation and Operating Manual.

9. The ARDIDEN 3G and ARDIDEN 3C models are equipped with a free turbine and a gas generator overspeed shutdown device. Refer to the applicable Installation and Operating Manual for additional details.

10. The EASA approved Airworthiness Limitations Section of the Instructions for Continued Airworthiness is published in the applicable Engine Maintenance Manual and Overhaul Manual documents, chapter 5 “Airworthiness Limitations”.

SECTION: ADMINISTRATIVE

I. Acronyms and Abbreviations

DOA: Design Organisation Approval
ISA: International Standard Atmosphere
SLS: Sea Level Static
AEO: All Engine Operative
OEI: One Engine Inoperative
HIRF: High Intensity Radiated Fields
EMI: Electromagnetic Interference

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	12 June 2017	Initial Issue	12 June 2017
Issue 02	05 April 2018	Addition of the ARDIDEN 3C model, various corrections for the ARDIDEN 3G model	05 April 2018

-END-

