TYPE-CERTIFICATE DATA SHEET

No. E. 030

for
TM 333 series engines

Type Certificate Holder
Safran Helicopter Engines

64510 Bordes
France

For Models:

TM 333 2B2
TM 333 2M2

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I. General

1. Type/ Model

TM 333 / 2B2, 2M2

2. Type Certificate Holder

Safran Helicopter Engines
64510 Bordes
FRANCE

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. Date of Application

TM 333 2B2: 18 November 1999
TM 333 2M2: 11 September 2002

Note: EASA type certification for the TM 333 2B2 was granted in accordance with article 2 paragraph 3(a) of EU Commission Regulation EC 1702/2003 based on the DGAC-France type certification. The Type Certificates for the variants TM 333 1A and TM 333 2B had been surrendered on 19 October 2006.

5. EASA Type Certification Date

TM 333 2B2: 21 December 2001 (initially DGAC-France Type Certificate Data Sheet n° M 14)
TM 333 2M2: 14 August 2007

II. Certification Basis

1. Reference Date for determining the applicable airworthiness requirements

For the TM 333 1A, the reference date was 30 September 1983.
For the TM 333 2B, the certification basis was modified 18 May 1990.
For the TM 333 2B2, the certification basis was modified 20 December 2001.
For the TM 333 2M2, the certification basis was modified 15 June 2007.

2. Certification Date:

TM 333 2B2: 21 December 2001 (initially DGAC-France Type Certificate Data Sheet n° M 14)
TM 333 2M2: 14 August 2007

3. EASA Certification Basis

3.1. Airworthiness Standards

TM 333 2B2	DGAC letter No. 2001/05992/SFACT/NME of 20 December 2001. JAR-E Change 6 of 28 August 1981, completed or modified by paragraphs E20, E25, E40, E50, E60, E150, E170, E515, E690, E730, E740, E820, E830 of JAR -E Change 10.
TM 333 2M2	JAR-E Change 6 dated 28 August 1981, completed or modified by the following paragraphs of JAR-E Change 10: JAR-E20, E25, E40, E60, E150, E170, E510, E680, E690, E730, E740, E820, E830. JAR-E 515 determination of life limits for the gas generator and free turbines JAR-E 50 for the engine control system (see also AMJ 20X-1)JAR-E 80 (b) for equipments JAR-E 530 (f) for fire precautions (see also AMJ 20X-1)

3.2. Special Conditions (SC)

TM 333 2B2 CS1: 30 sec and 2 min OEI (One Engine Inoperative) ratings according to NPA-E 19 of 24 October 2001.
CS2: 30 min HIP/SARM rating (or 30 min AEO).

3.3. Equivalent Safety Findings

TM 333 2B2, 2M2
JAR-E 25 (b) (2) and E-60 (h) as modified by NPA -E 19 dated 24 September 2001.

3.4. Deviations

TM 333 2B2, 2M2 None.

3.5. Environmental Protection

TM 333 2B2, 2M2 None.

III. Technical Characteristics

1. Type Design Definition

TM 333 2B2	P/N 0 333 00 516 0
TM 333 2M2	P/N 0 333 00 518 0

2. Description

The TM 333 engine is a twin spool turboshaft engine of modular design consisting of:
- an annular air intake with variable inlet guide vanes
- two stage axial compressor, a single stage centrifugal compressor driven by a single stage turbine
- an annular reverse flow combustion chamber
- a single stage axial power turbine driving a forward mounted reduction gearbox
- a control provided by a single channel digital engine control unit

The starter-generator and exhaust jet pipe are not part of engine type definition.

3. Equipment

Defined in TM 333 2B2 and TM 333 2M2 Installation and Operating Manual.

4. Dimensions

TM 333 2B2, 2M2	Length:	1045 mm
	Height:	754 mm
	Width:	454 mm

5. Dry Weight

TM 333 2B2	166.5 kg
TM 333 2M2	162.5 kg
Additional weight of residual oil and fuel:	3 kg

6. Ratings

	Power (kW)			
Rating	TM 333 2B2		TM 333 2M2	
	Thermal Power without Torque Limitations	Shaft Power with Torque Limitations ([1])	Thermal Power without Torque Limitations	Shaft Power with Torque Limitations ([1])
30 sec OEI	910	808	-	-
2 min OEI	841	808	-	-
30 min OEI	807	737	-	-
Take-off / 30-min AEO / 30-min HIP-SARM	825	773	807	456
Maximum continuous	736	684	736	368

([1]) Limitation by the EECU.

The minimum guaranteed power values indicated in the above table are defined under the following conditions:

- ISA conditions at sea level (15 °C, 1 013 mbar);
- At the engine test bed with hydraulic brake system;
- Neither air intake nor exhaust gas pressure drop;
- No bleed air;
- No power drawn by any accessories other than those required for engine operation;
- Fuel Low Heat Value: 43 136 kJ/kg;
- Engine equipped with a test bed air intake (6528135060) and primary exhaust pipe (6528135070).

The performance curves are given in the TM333 2B2 and TM 333 2M2 Performance Booklets.

7. Control System

The engine is controlled by a Full Authority Digital Engine Control (FADEC).
The FADEC shall be installed in the airframe. The installation conditions are defined in the Installation and Operating Manual.

8. Fluids (Fuel, Oil, Coolant, Additives)

Refer to Installation and Operating Manual

9. Aircraft Accessory Drives

Accessory	Direction of rotation (1)	Reduction ratio Nominal speed	Maximum steady state shaft power kW	Maximum torque daNm	Maximum static overhung load (2) daNm
Starter-generator	CW	0.25446 11 451 rpm	7.5	4.7	2,50

NOTE: (1) The direction of rotation is given as viewed from the outside. (CW: clockwise)
(2) Load exerted by the weight of the accessory overhung on the drive pad.

10. Maximum Permissible Air Bleed Extraction

For TM 333 2B2 and TM 333 2M2, P3 air bleed extraction for helicopter use.
Maximum air flow corresponding to 100 g/s at take-off rating for sea-level standard conditions.
Limitations on the use of air bleed are defined in the Installation and Operating Manual.

IV. Operating Limitations

1. Temperature Limits

1.1 Gas generator exhaust temperature (T45) limits

On start-up (for TM 333 2B2 and TM 333 2M2):

	T45 (°C)
For an unlimited duration	810
Maximum over-temperature (< 12 sec)	880

In flight (steady state conditions):

	T45 (°C)	
Rating	TM 333 2B2	TM 333 2M2
30 sec OEI	985	-
2 min OEI	925	-
30 min OEI	897	-
Take-off / 30-min AEO / 30-min HIP-SARM	904	897
Maximum continuous	853	853

1.2 Fuel temperature (TM 333 2B2 and TM 333 2M2):
Maximum fuel temperature:
Refer to Installation and Operating Manual
Minimum temperature for engine starting:
Refer to Installation and Operating Manual
Additives:
use of anti-icing additive for fuel temperature ≤ + 5°C

1.3 Oil temperature (TM 333 2B2 and TM 333 2M2):
Minimum oil temperature for engine starting:
-30 °C for oil between 3.9 and 5 cSt
-40 °C for oil with 3 cSt
Minimum oil temperature for power-up:
10 °C for oil between 3.9 and 5 cSt
0 °C for oil with 3 cSt
Maximum oil temperature:
115 °C

2. Speed Limits

2.1 Gas generator speed (N1)

100% N1 = 45 000 rpm.

Rating	TM 333 2B2		TM 333 2M2	
	Gas generator speed		Gas generator speed	
	%	rpm	%	rpm
30 sec OEI	101.92	45 864	-	-
2 min OEI	100.51	45 229	-	-
30 min OEI	99.88	44 946	-	-
Take-off / 30-min AEO / 30-min HIP-SARM	100.20	45 088	99.88	44 946
Minimum stabilized speed	74.60	33 570	74.60	33 570
Maximum continuous	98.58	44 361	98.58	44 361
Maximum overspeed, transient conditions < 5 seconds (excluding 30 sec and 2 min OEI)	101	45 450	101	45 450

At all ratings, the N1 varies depending on the ambient temperature. The instructions, which apply in the event of this temperature being exceeded, are indicated in the Installation and Operating Manual.

2.2 Power turbine speed (N2)

100%N2 = 37 562 rpm.

The power turbine nominal speed corresponds to 6 000 rpm at the power off-take.

For TM 333 2B2 and TM 333 2M2:

	Power Turbine Speed	
	%	rpm
Maximum speeds		
No limit on duration	105	39 440
Transient (5 seconds)	107	40 192
Minimum speeds		
No limit on duration	90	33 805
Transient (5 seconds)	90	33 805

3. Torque Limits

Maximum torque on shaft during operation:

	Torque (daNm)	
Rating	TM 333 2B2	TM 333 2M2
30 sec OEI	151.9	-
2 min OEI	151.9	-
30 min OEI	136	-
Take-off / 30-min AEO / 30-min HIP-SARM	123	123
Maximum continuous	108.8	108.8
Max. overtorque (20 sec)	136	136

4. Pressure Limits

4.1 Oil pressure

(TM 333 2B2 and TM 333 2M2)

Minimum oil pressure:	1 700 hPa for N1 ≥ 31 950 rpm (71%)
Maximum starting oil pressure:	20 000 hPa
Normal operating range:	2 500 to 5 000 hPa

4.2 Fuel pressure

Refer to TM 333 2B2 and TM 333 2M2 Installation and Operating Manual.

5. Installation Assumptions

Refer to TM 333 2B2 and TM 333 2M2 Installation and Operating Manual.

6. Dispatch Limitations

All engine control systems or equipment must be functional prior to aircraft take-off, except if defined in an approved MMEL.

V. Operating and Service Instructions

Document	TM 333 2B2	TM 333 2M2
Installation and Operating Manual	X 333 H8 002 2	X 333 H8 005 2
Performance Booklet	X 333 H8 004 2	X 333 B2 001 2
Maintenance Manual	X 333 H8 450 2	X 333 B2 450 2
Overhaul Manual	X 333 H8 500 2	X 333 B2 850 2
Service Letters and Service Bulletins	Refer to SL and SB directory	Refer to SL and SB directory

VI. Notes

1. The TM 333 2B2 engine is approved for use on twin-engine civil helicopters. The TM 333 2M2 engine is approved for use on single engine civil helicopters. Their Operating/Starting envelope is defined in the Installation and Operating Manual.

2. Air intake:
- The helicopter air intake design shall be such as to prevent instantaneous ingestion of maximum ice and water quantities, as defined in the Installation and Operating Manual.
- A protective grid as defined in the Installation and Operating Manual shall be installed to limit the ingestion of foreign matters in the engine.

3. On TM 333 2B2 the electronic control system provides a “TRAINING” function for training crews in an engine loss of automatic control system situation. Characteristics are defined in the Installation and Operating Manual.

4. On TM 333 2M2 the electronic control system provides a “TRAINING” function for training crews in an engine failure situation. Characteristics are defined in the Installation and Operating Manual.

5. The electronic control unit must not be installed in a dedicated fire zone. Installation conditions are defined in the Installation and Operating Manual.

6. Protection conditions against lightning and electromagnetic interference are defined in the Installation and Operating Manual.

7. Vibrations are measured by sensor on the rear flange of the turbine casing: refer to Installation and Operating Manual.

8. Overspeed: the engine is equipped with a shut-down device in case of power turbine overspeed.

9. "APU" function: On TM 333 2B2 only, the control system has an "APU" function for on-ground electrical power and hydraulic generation.

10. Life limited Components are defined in the Chapter 5 "Airworthiness Limitations Section" of the Maintenance Manual.

11. Conversion from non-civil use:
This note is applicable to the TM 333 engines originally assembled by Safran HE 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 Safran HE Mandatory Service Bulletin A333 72 0801.

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	31 October 2006	Initial Issue	Initial Issue, 31 October 2006
Issue 02	14 August 2007		14 August 2007
Issue 03	01 August 2016	Name change from Turbomeca to Safran Helicopter Engines	01 August 2016
Issue 04	22 February 2017	New temperature limitation on start-up and incorporation of the reference to the SB regarding "engine return to civil use"	
Issue 05	3 July 2017	Correction of max. over-temperature time on start-up	

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