TYPE-CERTIFICATE DATA SHEET

No. IM.E.021

for
CF34-10E series engines

Type Certificate Holder
General Electric Company
1 Neumann Way
Cincinnati
Ohio 45215-6310
USA

For Models:
CF34-10E2A1
CF34-10E5
CF34-10E5A1
CF34-10E6
CF34-10E6A1
CF34-10E7
CF34-10E7-B

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TABLE OF CONTENTS

I. General

1. Type/ Models:

CF34-10E2A1, -10E5, CF34-10E5A1, CF34-10E6, CF34-10E6A1, CF34-10E7, CF34-10E7-B

2. Type Certificate Holder

General Electric Company
1 Neumann Way
Cincinnati
Ohio 45215-6310
USA

3. Manufacturer

General Electric Company

4. Date of Application

CF34-10E5, CF34-10E5A1, CF34-10E6, CF34-10E6A1	CF34-10E2A1, -10E7	CF34-10E7-B
15 February 2001	13 January 2006	16 July 2008

5. Validation Reference Date:

9 February 2001

6. EASA Type Certification Date

CF34-10E5, CF34-10E5A1, CF34-10E6, CF34-10E6A1	CF34-10E2A1, -10E7	CF34-10E7-B
31 March 2006	01 August 2006	12 December 2008

II. Certification Basis

1. FAA Certification Basis details:

see FAA TCDS E00070EN

2. EASA Certification Basis:

2.1 Airworthiness Standards:

JAR-E Amendment 11, effective 1 November 2001,
CS-E 850 Compressor, fan and turbine shafts, effective 24 October 2003,
CS-E 890 Thrust reverser tests, effective 24 October 2003.

2.2 Special Conditions:

SC1: Certification of PLD´s and ASIC´s.

2.3 Equivalent safety finding:

None

2.4 Deviations:

None

2.5 EASA environmental protection requirements:

CS-34 Amendment 3 as implemented by ED Decision 2019/014/R (29th July 2019); ICAO Annex 16 Volume II, Amendment 9 (1st January 2018) as implemented into EU legislation 11th September 2018 ; NOx levels in compliance with Part III, Chapter 2, paragraph 2.3.2e) (CAEP/8) of the above mentioned Annex. Maximum nvPM mass concentration levels in compliance with Part III, Chapter 4, paragraph 4.2.2 (CAEP/10) of the above mentioned Annex.
(See note 10).

III. Technical Characteristics

1. Type Design Definition

For the CF34-10E model series, the engine type design definition includes thrust reverser system, which is part of the nacelle system, and is identified as follows:

Engine Parts List	Thrust Reverser Parts List
CF34-10E2A1GXX	601E0001-5XX
CF34-10E5GXX	601E0001-5XX
CF34-10E5A1GXX	601E0001-5XX
CF34-10E6GXX	601E0001-5XX
CF34-10E6A1GXX	601E0001-5XX
CF34-10E7GXX	601E0001-5XX
CF34-10E7-BGXX	601E0001-5XX

See Note 6

2. Description

Dual rotor, axial flow, high bypass ratio turbofan with single stage fan, 3-stage low pressure compressor, 9-stage high pressure compressor, annular combustion chamber, single stage high pressure turbine, 4-stage low pressure turbine, a thrust reverser, aft core cowl, exhaust nozzle, starter, and a full authority digital engine control (FADEC).

3. Equipment

Equipment are included in Type Design Definition.

4. Dimensions

Overall Length	4519 mm (177.93 inches)
Maximum diameter	1864 mm x 2199 mm (73.38 x 86.59 inches)

5. Dry Weight

2079 kg (4584 lb)

6. Ratings

Rating (see Note 2)		CF34-10E2A1	CF34-10E5	CF34-10E5A1	CF34-10E6
Thrust kN (lb)	Maximum Takeoff (5 min) (see Notes 3 and 4)	75.44 (16960)	83.72 (18820)	83.72 (18820)	83.72 (18820)
	Normal Takeoff (5 min) (see Notes 3 and 4)	75.44 (16960)	77.35 (17390)	83.72 (18820)	77.35 (17390)
	Maximum Continuous	67.21 (1511)	75.80 (17040)	75.80 (17040)	75.80 (17040)
Flat rate ambient temperature °C(°F)	Maximum Takeoff	30 (86)	30 (86)	30 (86)	35 (95)
	Maximum continuous	25 (77)	25 (77)	25 (77)	25 (77)

Rating (see Note 2)		CF34-10E6A1	CF34-10E7	CF34-10E7-B
Thrust kN (lb)	Maximum Takeoff (5 min) (see Notes 3 and 4)	83.72 (18820)	90.57 (20360)	90.57 (20360)
	Normal Takeoff (5 min) (see Notes 3 and 4)	83.72 (18820)	83.72 (18820)	83.72 (18820)
	Maximum Continuous	75.80 (17040)	75.80 (17040)	75.80 (17040)
Flat rate ambient temperature °C(°F)	Maximum Takeoff	35 (95)	30 (86)	30 (86)
	Maximum continuous	25 (77)	25 (77)	25 (77)

7. Control System

The engine is equipped with a Full Authority Digital Engine Control (FADEC) system.

System		Component
Fuel Metering Unit		2043M10
Full Authority Digital Engine Control (FADEC)	hardware	2043M11
	software	2043M65
Configuration Plug	Hardware	2162M48
	Engine Rating	2041M41
	Engine Configuration	2041M42
	N1 Trim Setting	2041M43
Ignition System	2 Ignition Exciters	9238M66
	2 Ignition Plugs	1374M12
Fuel Pump		2043M12

8. Fluids

8.1 Fuel:

Fuel conforming to GE Jet Fuel Specification No. D50TF2 is applicable for all models. See GEK 112084, Operating Instructions, for specific fuels approved per the subject specifications.

8.2 Oil:

Oil conforming to GE Specification No. D50TF1 is applicable for all models. See GEK 112084, Operating Instructions, for specific oils approved per the subject specifications.

9. Aircraft Accessory Drives

Accessory	Location on AGB Axis	Speed, rpm	Power (rated), kW (HP)	Direction of rotation (facing AGB)	Torque Static/ Continuous/ Overload, Nm (lb-in)	Max. Acc. Wt, kg (lb)	Overhung Moment, Nm (lb-in)	Shear Torque, Nm (lb-in)
Lube & Scavenge Oil Pump	Axis-J Aft	8575	5.22 (7)	CCW	33.9 (300) (*1) /5.4 (48) / NA	4.67 (10.3)	3.73 (33)	84.7-96.0 (750-850)
IDG	Axis-G Fwd	7928	55.8 (74.8) (*2)	CW	76.3 (675) (*1) / 67.2 (595) / 127.6 (1129) (5 min) (*4) 181.4 (1605) (5 sec) (*4)	36.83 (81.2) (*6)	81.3 (720) maximum	355.2-412.2 (3144-3648)
Air Turbine Starter	Axis-D Fwd	12281	NA	CW	238.6 (2112), 474.6 (4200) (*3) / NA / NA	12.56 (27.7)	12.8 (113)	711.8-847.4 (6300-7500)
Hydraulic Pump	Axis-F Fwd	5567	26.1 (35)	CW	64.7 (573) (*1) (*5) / 44.3 (392) / 75.7 (670)	6.30 (13.9) (dry)	4.34 (38.4)	226.4 (2004) maximum
Alternator	Axis-J Fwd	8575	2.98 (4)	CW	NA/NA/NA	1.36 (3.0)	0.29 (2.6)	NA
Fuel Pump	Axis-E Aft	7928	41.0 (55)	CW	16.9 (150)/27.1 (240)/NA	12.97 (28.6)	16.0 (142)	158.2-174.0 (1400-1540)

CW - Clockwise CCW - Counter Clockwise

Accessory Speeds are based on Core Speed: 17160rpm

(*1) -40°C (-40°F) SLS
(*2) HP is constant over the operating range with slight variations due to changes in efficiency. HP extraction is 55.8 kW (74.8 HP) at 7898 rpm (pad speed) and 54.8 kW (73.5 HP) at 4618 rpm (pad speed). The 5 minute overload rating is 61.7 kW (82.7 HP) and the 5 second overload rating is 102.4 kW (137.37 HP)

(*3) 238.6 Nm (2112 in-lbs) at 15°C (59°F) SLS, 4200 in-lbs at -40°C (-40°F) SLS
(*4) Overload at 4618 rpm (pad speed)
(*5) 64.7 Nm (573 in-lbs) at 626 rpm (pad speed)
(*6) Includes oil and V band coupling

10. Maximum Permissible Air Bleed Extraction: (See Note 5)

	Maximum demonstrated bleed air (% of total compressor airflow) CF34-10E (all models)
Compressor stage 5	8.0
Compressor stage 9	12.0
Maximum allowable bleed	12.0

IV. Operating Limitations

1. Temperature Limits

1.1 Exhaust Gas Temperature °C (°F):

Indicted maximum permissible temperatures are listed below. In addition the CF34-1-E2A1 model incorporates an EGT shunt of 30°C at fan speeds above idle. Thus, for a measured EGT of 953°C the indicated EGT is 983°C. All CF34-10E series engines are certified with a take-off EGT transient allowance. This allowance applies to normal maximum takeoff EGT, up to 5.5°C for 2 seconds, 4.4°C for 5 seconds, 3.6°C for 15 seconds, and 2.4°C for 30 seconds.

	CF34-10E2A1	CF34-10E5	CF34-10E5A1	CF34-10E6
Maximum Takeoff (5 minutes)	983 (1801)	983 (1801)	983 (1801)	983 (1801)
Normal Takeoff (5 minutes)	983 (1801)	939 (1722)	983 (1801)	938 (1720)
Maximum Continuous	960 (1760)	960 (1760)	960 (1760)	960 (1760)
At start up, ground	740 (1364)	740 (1364)	740 (1364)	740 (1364)
At start up, inflight	875 (1607)	875 (1607)	875 (1607)	875 (1607)

	CF34-10E6A1	CF34-10E7	CF34-10E7-B
Maximum Takeoff (5 minutes)	983 (1801)	983 (1801)	983 (1801)
Normal Takeoff (5 minutes)	983 (1801)	943 (1729)	943 (1729)
Maximum Continuous	960 (1760)	960 (1760)	960 (1760)
At start up, ground	740 (1364)	740 (1364)	740 (1364)
At start up, in-flight	875 (1607)	875 (1607)	875 (1607)

The exhaust gas temperature is measured by 9 probes, which are equally spaced and mounted in the second-stage low-pressure turbine vanes.

1.2 Oil Temperature (measured in the oil tank) °C (°F):

Continuous Operation: 155 (311)

1.3 Fuel Inlet Temperature (at engine fuel filter inlet) °C (°F):

Continuous Operation: 68.3 (155)

2. Maximum Permissible Rotor Speeds:

		CF34-10E (all models)
Maximum takeoff	Low pressure rotor (N1), rpm	6325
	High pressure rotor (N2), rpm	18018
Normal takeoff	Low pressure rotor (N1), rpm	6325
	High pressure rotor (N2), rpm	18018
Maximum continuous	Low pressure rotor (N1), rpm	6325
	High pressure rotor (N2), rpm	18018

100% N1 rotor speed is 5954.4 rpm
100% N2 rotor speed is 17160 rpm

3. Pressure Limits

3.1 Fuel Pressure

At engine pump inlet: minimum pressure of 34.5 kPa (5 PSID) above the true vapour pressure of the fuel with a vapour/liquid ratio of zero with aircraft boost operative. Operating range 34.5 kPa to 344 kPa (5 PSIG to 50 PSIG). At engine motive flow discharge: minimum pressure of 1034 kPa (150 PSIG) at idle or above. Operating range is 1034 kPa to 8336 kPa (150 PSIG to 1209 PSIG). See GE Installation Manual GEK 112083 for additional limits.

3.2 Oil Pressure

Minimum oil pressure limit is 172 kPa (25 PSID). For oil temperatures less than -20□C, the minimum oil pressure is 35kPa (5 PSID) for the first two minutes following an engine start. After two minutes at idle or if the engine power is increased above idle, the minimum oil pressure is 172 kPa (25 PSID). See GE Installation Manual GEK 112083 for additional limits.

4. Installation Assumptions:

The installation assumptions are quoted in the Engine Installation Manual GEK 112083.

5. Time Limited Despatch

Criteria pertaining to the dispatch and maintenance requirements for the engine control systems are specified in the airworthiness section of the Engine Manual, GEK 112081, which defines the various configurations and maximum operating intervals.

6. ETOPS

Not applicable

V. Operating and Service Instructions

	CF34-10E (all models)
Operating Instructions	GEK 112084
Installation Manual	GEK 112083
Engine Manual (including on-wing maintenance)	GEK 112081

VI. Notes

1. This Note has been deleted.

2. Engine ratings are based on calibrated test stand performance, and performance calculations are based on accepted parameter correction methods documented in the production data folder. These calculations assume the following conditions:
   1. Static sea level standard conditions of 15°C (59°F) and 101.32 kPa (29.92 inches Hg).
   2. No aircraft accessory loads or air extraction.
   3. No anti-icing; no inlet distortion; no inlet screen losses; and 100% ram recovery.
   4. Production engine inlet and production flight exhaust system

3. This engine is equipped with an automatic power reserve function for takeoff operation with one engine inoperative. During takeoff, when the automatic power reserve function is activated, the engine control of the inoperative engine sends an input signal to the engine control of the operating engine. Upon receiving this signal, the engine thrust of the operating engine automatically increases from normal takeoff (NTO) or lower thrust to the corresponding, pre-determined maximum takeoff (MTO) thrust. Full MTO thrust is available to the pilot at any time by throttle selection.

   The engine control system also incorporates schedules that assure a fully degraded engine, during operation at the NTO of lower thrust, will achieve the specified MTO thrust without exceeding the engine operating limits when the automatic power reserve function is activated.

4. The time limit at the normal takeoff rating is five minutes and shall include any time accumulated above the normal takeoff rating for that takeoff. The 5-minute takeoff time limit may be extended to 10 minutes for one engine inoperative operation in multi-engine aircraft.

5. Air Bleed Extraction - maximum customer air bleed extraction is as follows: Customer bleed air is available from either stage 5 or 9 (compressor discharge) of the compressor at all operating conditions at or above idle (No compressor bleed is permitted below idle). Customer bleed is scheduled to switch from stage 9 bleed at low power operation to stage 5 bleed at high power operation as described in GE Installation Manual GEK 112083 (CF34-10E all models).

6. The Engine Manual, GEK 1122081, defines the installation requirements for the engine GXX or –5XX indicates all parts list designations, for example G01, G02, -501, -502, etc.

7. The maximum permissible inlet distortion is specified in GE Installation Manual GEK 112083. Ground operational limits and procedures for operation in crosswind are specified in GE Specific Operating Instructions GEK 112084.

8. Engine Configuration Plug part numbers 2041M42P02; 2041M42P06; 2041M42P08 and 2041M42P09 are not EASA approved configurations for all CF34-10E engine models.

9. The engine models CF34-10E2A1, -10E5, CF34-10E5A1, CF34-10E6, CF34-10E6A1, CF34-10E7, CF34-10E7-B were recertified to show compliance with the NOx Standards defined in ICAO - Annex 16, Volume II, Part III, Chapter 2
   - paragraph 2.3.2 d (CAEP/6 NOx production rule).
   - paragraph 2.3.2 e (CAEP/8 NOx Standard).

10. Per EASA Certificate 10072070 17 December 2019, the engine models CF34-10 series were recertified to show compliance with the CAEP/10 nvPM Emissions as defined in II 2.5 above.

SECTION: ADMINISTRATIVE

I. Acronyms and Abbreviations

n/a

II. Type Certificate Holder Record

General Electric Company

III. Change Record

Issue	Date	Changes	TC issue
Issue 01	31 March 2006	Initial Issue	Initial Issue, 31 March 2006
Issue 02	01 August 2006	Addition of CF34-10E2A1 and CF34-10E7 engine models	01 August 2006
Issue 03	18 January 2007	Modification to the Maximum Continuous Thrust Ratings	
Issue 04	12 December 2008	Addition of CF34-10E7-B engine model	12 December 2008
Issue 05	03 January 2013	Recertification to show compliance with NOx regulation of ICAO Annex 16, Volume II, Part III, Chapter 2, § 2.3.2 e) (CAEP/8) (EASA Major Change Approval 10042698)	
Issue 06	15 January 2020	The engine models CF34-10 series were recertified to show compliance with the CAEP/10 nvPM Emissions as defined in II 2.5 above (EASA Major Change Approval 10072070 17 December 2019). Dry Weight revised. Reformatted to latest EASA standard.	

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