

**COMANDO DA AERONÁUTICA
DEPARTAMENTO DE PESQUISAS E DESENVOLVIMENTO
CENTRO TÉCNICO AEROESPACIAL**

TYPE CERTIFICATE DATA SHEET Nº EM-8213

Type Certificate Holder:

HONEYWELL INTERNATIONAL INC.
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USA

EM-8213-02

Sheet 01

HONEYWELL

TFE731-2, TFE731-3,
TFE731-3A, TFE731-3AR,
TFE731-3B, TFE731-3BR,
TFE731-3C, TFE731-3CR,
TFE731-4, TFE731-4R,
TFE731-5, TFE731-5R,
TFE731-5A, TFE731-5AR,
TFE731-5B, TFE731-5BR

February 2006

Engines of models described herein conforming with this data sheet, which is part of Type Certificate No.8213, meet the minimum standards for use in certificated aircraft in accordance with pertinent aircraft data sheets and applicable portions of the Brazilian Aeronautical Regulations provided they are installed, operated, and maintained as prescribed by the approved manufacturer's manuals and other instructions.

MODEL TFE731-2, TFE731-3, TFE731-3A, TFE731-3AR, TFE731-3B, TFE731-3BR, TFE731-3C, TFE731-3CR, TFE731-4, TFE731-4R, TFE731-5, TFE731-5R, TFE731-5A, TFE731-5AR, TFE731-5B, TFE731-5BR

TYPE Turbofan: One stage geared fan, four stage axial flow low pressure compressor, one stage centrifugal high pressure compressor, annular combustor, one stage high pressure turbine, and three stage low pressure turbine.

	TFE731 -2	TFE731 -3	TFE731 -3A	TFE731- 3AR	TFE731 -3B	TFE731 -3BR	TFE731 -3C	TFE731 -3CR
RATINGS Takeoff (5 min) at sea level								
Static Thrust, lbf	3 500	3 700	--	3 880	3 650	3 850	3 700	3 880
Low Pressure Rotor (N1), rpm	20 688	21 000	--	--	--	--	--	--
High Pressure Rotor (N2), rpm	29 692	--	--	29 989	2 9692	29 989	29 692	29 989
Measured Interstage Temperature, °F (°C)	1 580(860)	1 665(907)	--	1 705(929)	1 635(890)	1 680(916)	1 670(910)	1 705(929)
Maximum Continuous at sea level								
Static Thrust, lbf	3 500	3 700	--	--	3 650	--	3 700	--
Low Pressure Rotor (N1), rpm	20 688	21 000	--	--	--	--	--	--
High Pressure Rotor (N2), rpm	29 692	--	--	29 989	29 692	29 989	29 692	29 989
Measured Interstage Temperature, °F (°C)	1 530(832)	1 625(885)	--	1 625(885)	1 635(890)	--	1 670(910)	--
	TFE731 -4	TFE731 -4R	TFE731 -5	TFE731 -5R	TFE731 -5A	TFE731- 5AR	TFE731 -5B	TFE731 -5BR
RATINGS Takeoff (5 min) at sea level								
Static Thrust, lbf	4 080	--	4 304	4 500	--	--	4 750	--
Low Pressure Rotor (N1), rpm	21 000	--	--	--	--	--	--	--
High Pressure Rotor (N2), rpm	29 989	30 300	29 692	29 989	29 692	29 989	30 300	30 540
Measured Interstage Temperature, °F (°C)	1 746(952)	1 786(974)	1 746(952)	1 786(974)	1 746(952)	1 786(974)	1 793(978)	1 824(996)
Maximum Continuous at sea level								
Static Thrust, lbf	4 080	--	4 304	--	4 500	--	4 634	--
Low Pressure Rotor (N1), rpm	21 000	--	--	--	--	--	--	--
High Pressure Rotor (N2), rpm	29 989	30 300	29 692	29 989	29 692	29 989	30 300	30 540
Measured Interstage Temperature, °F (°C)	1 696(924)	--	--	--	--	--	1 775(968)	--

PRINCIPAL DIMENSIONS

Refer to the installation drawing for each specific engine model configuration for dimensions and center of gravity location. The engine weights shown herein are that of the power section and all components coded "E" in the Engine Equipment List. The total engine weight, including the weight of items coded "A" in the Engine Equipment list, is included on the engine installation drawing for each specific aircraft configuration.

**PRINCIPAL
DIMENSIONS (Cont.)**

	TFE731 -2	TFE731 -3	TFE731 -3A/-3AR	TFE731 -3B/-3BR	TFE731 -3C/-3CR	TFE731 -4/-4R	TFE731 -5/-5R	TFE731- 5A/-5AR	TFE731 -5B/-5BR
Weight, dry, lb (maximum)	743	754	775	769	777	822	852	884	899

**ENG. CONTROL
SYSTEM**

For all Models:

Fuel controls and power management are controlled by a Digital Electronic Engine Control (DEEC) with a backup hydromechanical control. The hardware and software configurations of this system and the associated engine fuel pump and hydromechanical unit are controlled by an approved engine equipment list for each specific engine model and aircraft application.

FUEL TYPE

For all models:

Fuels conforming to Honeywell International Inc. Specifications EMS 53111 (Jet A Type), EMS 53112 (Jet A-1 and JP-8 Types), EMS 53113 (Jet B and JP-4 Types), and EMS 53116 (JP-5 Type).

BIOBAR JF biocide additive is approved for use in the fuel at a concentration not to exceed 20 ppm of elemental boron.. KATHON FP 1.5 biocide additive is approved for use in the fuel at a concentration not to exceed 100 ppm.

Shell ASA-3 Anti-Static Additive, or equivalent, in amounts to bring the fuel up to a range of 50 to 450 conductivity units for JET A, JET A-1, and JET B, or up to a range of 200 to 600 conductivity units for JP4, 5, and 8, is permissible as long as the quantity added does not exceed one part per million.

MIL-I-27686 "D" and "E" inhibitor, icing, fuel system, or equivalent, are approved for use in fuel in amounts up to 0.15 percent by volume.

Aviation Gasoline, MIL-G-5572D, Grade 80/87, 100/130, and 115/145, not in excess of 500 gallons per 100 hours of operation, may be used in emergencies in TFE731-2/-3 series engines which do not incorporate a fuel heater.

OIL, LUBRICATION

For all models:

Oil conforming to Honeywell International Inc. Specification EMS53110, Type 2.

TEMPERATURE LIMITS	Maximum Interstage Turbine Temperature (ITT) Limits: °F(°C)	TFE731 -2	TFE731 -3/-3A	TFE731 -3R/-3AR	TFE731 -3B	TFE731 -3BR	TFE731 -3C	
	Maximum continuous	1 530 (832)	1 625 (885)	--	1 635 (890)	--	1 670 (910)	
	Takeoff (5 min)	1 580 (860)	1 665 (907)	1 705 (929)	1 635 (890)	1 680 (916)	1 670 (910)	
	Starting (Ground/Air)	1 580 (860)	1 665 (907)	--	1 635 (890)	--	1 670 (910)	
	Maximum Interstage Turbine Temperature (ITT) Limits: °F(°C)	TFE731 -3CR	TFE731 -4/-5/-5A	TFE731 -4R/-5R/-5AR	TFE731 -5B	TFE731 -5BR		
	Maximum continuous	1 670 (910)	1 696 (924)	--	1 775 (968)	--		
	Takeoff (5 min)	1 705 (929)	1 746 (952)	1 786 (974)	1 793 (978)	1 824 (996)		
	Starting (Ground/Air)	1 670 (910)	1 746 (952)	--	1 793 (978)	--		
	Maximum Oil Inlet Temperature Range, °F (°C) for all engine models:							
	Fan Gearbox Inlet Maximum:							
	Sea Level to 30 000 Feet	260 (127)						
	Above 30 000 Feet	284 (140)						
	Accessory Gearbox Inlet Maximum							
Sea Level to 30 000 Feet	300 (149)							
Above 30 000 Feet	315 (157)							
More details See Note 1								

PRESSURE LIMITS

For all engine models:

Fuel pump inlet pressure,	minimum	(1)
	maximum	50 psig
Oil pressure,	idle minimum	25 psig
	normal operating range	38 to 46 psig
Oil pressure at inlet connection to engine,	minimum	4.0 psia

(1) Refer to applicable engine installation manual (See Note 10).

IMPORT REQUIREMENTS Each engine imported separately and/or spare parts must be accompanied by an airworthiness approval issued by FAA (or a third country authority, in case of used engine imported from such country) attesting that the particular engine and/or parts were submitted to the governmental quality control before delivery and are in conformity with the CTA approved type design. The CTA type design corresponds to the FAA approved type design, as stated in CTA Report V.33-0170-01 dated 09 February 2006 or further revisions.

CERTIFICATION BASIS	RBHA 33 (Brazilian Requirements for Aeronautical Certification), which endorses the FAR 33 effective 01 February 1965, as amended by 33-1 through 33-3, dated 03 April 1967, and Special Condition No. 33-44-WE-13 for all models. (See NOTES 12 and 13.)	<u>Model</u>	<u>Application</u>	<u>Issued TC</u>
		TFE731-3	06 Feb. 1981	03 Aug. 1982
		TFE731-3A	20 May 1982	03 Aug. 1982
		TFE731-2	08 Jan. 1985	08 Aug. 1985
		TFE731-3B, -3BR	08 May 1984	08 Aug. 1985
		TFE731-5, -5R	30 Jan. 1985	08 Aug. 1985
		TFE731-5B, -5BR	30 Apr. 1991	15 Apr. 1994
		TFE731-5A, -5AR	06 May 1991	15 Apr. 1994
		TFE731-3C, -3CR	09 Mar. 1993	15 Apr. 1994
		TFE731-4, -4R	12 Mar. 1993	15 Apr. 1994
	TFE731-3AR	19 Dec. 2003	13 Dec. 2005	

PRODUCTION BASIS Production Certificate No. 413, issued 04 March 1965, and reissued as Production Certificate No. 413NM to Honeywell International Inc. on 25 January 2000.

NOTES:

- NOTE 1** Fan gearbox oil inlet temperature transient of 300°F (149°C) for a maximum of 2 minutes is permitted for all operational altitudes. External engine components, maximum temperature (limiting temperature of specific components) are as specified in the applicable engine installation manual, See Note 10.
- Operation at an engine fuel inlet temperature as high as 135°F (57°C) and as low as -65°F (-54°C) is approved with fuel at or above the pour point during starting. If fuel that does not contain an approved anti-icing additive is used, an approved engine fuel heater, or an alternate system capable of maintaining a fuel filter inlet temperature of 35°F, must be used. In installations that do not use an approved fuel heater and may extract motive flow for aircraft injector systems, engine operation with inoperative electronic fuel control is limited to a minimum inlet fuel temperature of 12°F(-11°C) with 1000 pounds per hour (maximum) motive flow extraction and -31°F(-35°C) without motive flow extraction. Installations which are equipped with the hydromechanical fuel control heater are approved for operation with fuel inlet temperature as low as -65°F(-54°C) provided fuel is at or above the pour point.
- NOTE 2** The ratings are based on static test stand operation and under the following conditions:
- (a) No loading of accessory drives.
 - (b) No compressor bleed airflow.
 - (c) Bellmouth inlet conforming to Honeywell International Inc. Drawing SKP17308 (TFE731-2, -3, -3A, -3AR, -3B, -3BR, -3C, -3CR, -4, and -4R models) and SKP23600 (TFE731-5, -5R, -5A, -5AR, -5B, and -5BR models).
 - (d) Fan exhaust and turbine exhaust nozzles conforming to Honeywell International Inc. Drawing SKP17303 (TFE731-2 model), SKP17402 (TFE731-3, -3A, -3AR, -3B, -3BR, -3C, and -3CR models), SKP24628 (TFE731-4 and -4R models), SKP17829 (TFE731-5 and -5R models), SKP23873 and SKP23640 (TFE731-5A and -5AR models), and SKP24301 and SKP23640 (TFE731-5B and -5BR models). The aerodynamic flow path of this fan duct includes Honeywell International Inc. operational air-oil coolers (P/Ns 158600, 159900, and 159910 with oil flowing).
 - (e) No anti-icing airflow.
 - (f) Interstage Turbine Gas Temperature (ITT) and rotor speed limits not exceeded.

NOTE 3 Accessory Drive Provisions:

Accessory Drive	Drive Type	Drive Modification	Rotation Facing Drive End and rpm at N2 of 29.024 rpm	Max. Torque (lb.in)			Accessory Weight Pounds-max.	Maximum Overhung Moment (lb.in)
				Tc	To	Ts		
Starter or Starter Generator	AND20002 Type XII-D (modified)	Pad rotated, rpm, torques, accessory weight and moment	CW 12000	210	315	1 600	45	400
Aircraft Accessory	AND20002 Type XII-D (modified)	Pad rotated, rpm, torques, accessory weight and moment	CW 12000	210	315	1000	40	400
Aircraft Accessory	AND20001 Type XI-B (modified)	Pad rotated, rpm, torques, accessory weight and moment	CW 6000	250	375	1650	15	100

CW = clockwise To = torque overload Tc = continuous torque Ts = static torque

Note: Total weight of the accessories is not to exceed 95 pounds. Refer to the applicable engine installation manual (See Note 10).

NOTE 4 For compressor bleed airflow limits, refer to the applicable engine installation manual (See Note 10).

NOTE 5 These engines meet CTA/FAA requirements for turbine disk integrity and rotor blade containment.

NOTE 6 These engines meet CTA/FAA requirements for operation in icing conditions within the envelope defined in RBHA/CFR 14 Part 25, Appendix C.

NOTE 7 Certain engine parts are life-limited. These limits are listed in the FAA approved Honeywell International Inc. Service Bulletins TFE731-72-3001 and TFE731-72-3501.

- NOTE 8** Variations in engine configuration and installation components are identified by a suffix to the basic model number on the engine nameplate, i.e. TFE731-2-XY, (“X” denotes Honeywell installed configurations rating code number(s) and “Y” denotes Honeywell equipment code letter(s) of aircraft manufacturer), and an Engine Equipment List number. Certain features of these components are influenced by aircraft design considerations. In the Engine Equipment List, those items coded "E" are basic engine items and are controlled by Part 33 of the Federal Aviation Regulations. Items coded "A" have been demonstrated as compatible with the basic engine during engine certification testing. However, the operation, functioning, and performance of these in a specific aircraft installation must be demonstrated during aircraft certification. Subsequent design control associated with these factors is the responsibility of the aircraft manufacturer.
- NOTE 9** Power setting, power checks and control of engine thrust output in all operations is to be based on Honeywell International Inc. engine charts referring to low pressure rotor speed (N1). Speed sensors are included in the engine assembly for this purpose.
- NOTE 10** For additional authorized operation and installation detailed information, refer to FAA approved sections of the applicable engine installation manuals as follows:
IM-8001: TFE731-2, -3, -3A, -3AR, -3B, -3BR, -3C, -3CR
IM-7440: TFE731-4, -4R
IM-4200: TFE731-5, -5R, -5A, -5AR, -5B, -5BR
- NOTE 11** The TFE731-3R, -3AR, -3BR, -3CR, -4R, -5AR, -5BR, and -5R turbofan engines with their electronic fuel control systems are adjusted for the limits noted herein.
- NOTE 12** These engines meet the requirements of RBHA/FAR 33.68, 33.71(c), 33.75, 33.77 and 33.90 effective with Amendment 33-6.
- NOTE 13** These engines are in compliance with FAR 34 of the Federal Aviation Regulations.

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