

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

TYPE CERTIFICATE DATA SHEET Nº EM-2004T03

Type Certificate Holder:

**PRATT & WHITNEY DIVISION
UNITED TECHNOLOGIES CORPORATION**
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East Hartford
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EM-2004T03

Sheet 01

PRATT & WHITNEY

PW4074, PW4077,
PW4084, PW4074D,
PW4077D, PW4084D,
PW4090, PW4090-3,
PW4090D, PW4098

September 2004

Engines of models described herein conforming with this data sheet, which is part of Type Certificate No. 2004T03, 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.

I - MODELS PW4074, PW4077, PW4084

TYPE Axial airflow, dual-spool, turbofan, single-stage fan, 6-stage low-pressure compressor, 11-stage high-pressure compressor, annular combustor, 2-stage high-pressure turbine, 7-stage low-pressure turbine.

RATINGS (See Note 5)

	PW4074	PW4077	PW4084
Static thrust at sea level, daN (lb)	34 447.03 (77 440)	35 567.98 (79 960)	38 592.77 (86 760)
Takeoff, dry 5 minutes (See Note 18)			
Maximum Continuous	30 959.62 (69 600)	31 577.93 (70 990)	31 577.93 (70 990)

COMPONENTS

Fuel Metering unit	Hamilton Standard Model Number JFC-131-4
Fuel Pump and filter	Argo-Tech Model 723300
Electronic Engine Control (EEC)	Hamilton Standard EEC 170 P/N 812460-All
Ignition	
Exciter	Unison Industries P/N 10-621630-1
Ignitors	Auburn P/N 0270408 Champion P/N AA1345-1
EEC alternator	
Stator	Unison (formerly B.F. Goodrich) P/N 430073
Rotor	Unison (formerly B.F. Goodrich) P/N 430074
Fuel distribution valve	Hamilton Standard P/N GTA40
Station 2.5 bleed actuator	Hamilton Standard P/N GTA42
Stator vane actuator	Hamilton Standard P/N GTA41
PT2/TT2 probe	Rosemount P/N 154 GT

FUEL TYPE

See Note 9

OIL, LUBRIFICATION

See Note 10

TEMPERATURE LIMITS

See Note 2

PRESSURE LIMITS

See Note 3

PRINCIPAL DIMENSIONS	Length (flange to flange) mm (in)	4 836.74 (190.423)				
	Nominal diameter (fan case) mm (in)	3 022.60 (119.000)				
	Maximum radial projection (oil tank) mm (in)	1 776.63 (69.946)				
WEIGHT (DRY)	Weight of basic engine includes PW supplied engine build-up components, kg (lb)	6 846.98 (15 095)				
CENTER OF GRAVITY	Axial: Engine station, mm (in)	2976.88 ± 25.4 (117.2 ± 1.0)				
	Vertical: Relative to engine, mm (in)	-35.56 ± 12.7 (-1.4 ± 0.5)				
	Lateral: Relative to centerline, mm (in)	-15.24 ± 12.7 (-0.6 ± 0.5)				
II - MODELS	PW4074D, PW4077D, PW4084D, PW4090, PW4090-3					
TYPE	Axial airflow, dual-spool, turbofan, single-stage fan, 6-stage low-pressure compressor, 11-stage high-pressure compressor, annular combustor, 2-stage high-pressure turbine, 7-stage low-pressure turbine.					
RATINGS (See Note 5)		PW4074D	PW4077D	PW4084D	PW4090	PW4090-3
	Static thrust at sea level, daN (lb)	34 447.03 (77 440)	35 567.98 (79 960)	38 592.77 (86 760)	40 830.23 (91 790)	40 830.23 (91 790) (See Note 19)
	Takeoff, dry 5 minutes (See Note 18) Maximum Continuous	30 959.62 (69 600)	31 577.93 (70 990)	31 577.93 (70 990)	33 339.42 (74 950)	33 339.42 (74 950)
COMPONENTS	Fuel Metering unit	Hamilton Standard Model Number JFC-131-4				
	Fuel Pump and filter	Argo-Tech Model 723300				
	Electronic engine control (EEC)	Hamilton Standard EEC 170 P/N 816200-All				

COMPONENTS (Cont.)	Ignition	
	Exciter	Unison Industries P/N 10-621630-2
	Ignitors	Auburn P/N 0270307 Champion P/N AA72S
	EEC alternator	
	Stator	Unison (formerly B.F. Goodrich) P/N 430073
	Rotor	Unison (formerly B.F. Goodrich) P/N 430074
	Fuel distribution valve	Hamilton Standard P/N GTA40-1
	Station 2.5 bleed actuator	Hamilton Standard P/N GTA42-2
	Stator vane actuator	Hamilton Standard P/N GTA41-1
PT2/TT2 probe	Rosemount P/N 154GT	
FUEL TYPE	See Note 9	
OIL, LUBRIFICATION	See Note 10	
TEMPERATURE LIMITS	See Note 2	
PRESSURE LIMITS	See Note 3	
PRINCIPAL DIMENSIONS	Length (flange to flange) mm (in)	4 836.74 (190.423)
	Nominal diameter (fan case) mm (in)	3 022.60 (119.000)
	Maximum radial projection (oil tank) mm (in)	1 776.63 (69.946)
WEIGHT (DRY)	Weight of basic engine includes PW supplied engine build-up components, kg (lb)	7 140.00 (15 741)
CENTER OF GRAVITY	Axial: Engine station, mm (in)	3 022.60 ± 25.4 (119.0 ± 1.0)
	Vertical: Relative to engine, mm (in)	-30.48 ± 12.7 (-1.2 ± 0.5)
	Lateral: Relative to centerline, mm (in)	-12.70 ± 12.7 (-0.5 ± 0.5)

III - MODELS

PW4090D, PW4098

TYPE

Axial airflow, dual-spool, turbofan, single-stage fan, 7-stage low-pressure compressor, 11-stage high-pressure compressor, annular combustor, 2-stage high-pressure turbine, 7-stage low-pressure turbine.

RATINGS (See Note 5)

Static thrust at sea level, daN (lb)	PW4090D	PW4098
	40 830.23	44 055.19
Takeoff, dry 5 minutes (See Note 18)	(91 790)	(99 040)
Maximum Continuous	33 339.42	34 393.65
	(74 950)	(77 320)

COMPONENTS

Fuel Metering unit	Hamilton Standard Model Number JFC-131-4
Fuel Pump and filter	Argo-Tech Model 827800
Electronic Engine Control (EEC)	Hamilton Standard EEC 170 P/N 822830-5-All
Ignition	
Exciter	Unison Industries P/N 10-621630-2
Ignitors	Champion P/N CH31923-5
EEC alternator	
Stator	Unison (formerly B.F. Goodrich) P/N 430073
Rotor	Unison (formerly B.F. Goodrich) P/N 430074
Fuel distribution valve	Hamilton Standard P/N GTA40-1
Station 2.5 bleed actuator	Hamilton Standard P/N GTA42-2
Stator vane actuator	Hamilton Standard P/N GTA41-1
PT2/TT2 probe	Rosemount P/N 154 GT

FUEL TYPE

See Note 9

OIL, LUBRIFICATION

See Note 10

TEMPERATURE LIMITS

See Note 2

PRESSURE LIMITS See Note 3

PRINCIPAL DIMENSIONS

Length (flange to flange) mm (in)	4 836.74 (190.423)
Nominal diameter (fan case) mm (in)	3 034.44 (119.466)
Maximum radial projection (oil tank) mm (in)	1 776.63 (69.946)

WEIGHT (DRY) Weight of basic engine includes PW supplied engine build-up components, kg (lb) 7 375.41 (16 260)

CENTER OF GRAVITY

Axial: Engine station, mm (in)	2 971.8 ± 25.4 (117.0 ± 1.0)
Vertical: Relative to engine, mm (in)	-33.02 ± 12.7 (-1.3 ± 0.5)
Lateral: Relative to centerline, mm (in)	-12.70 ± 12.7 (-0.5 ± 0.5)

IMPORT REQUIREMENTS Each engine imported separately and/or spare parts must be accompanied by an Airworthiness Certificate for Export and/or an Airworthiness Approval Tag respectively, issued by FAA, 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.

CERTIFICATION BASIS RBHA 33 corresponding to FAR 33 including Amendments 33-1 through 33-15 effective 16 August 1993; and RBHA 34 corresponding to FAR 34 including Amendment 34-1 through 34-2 effective 29 December 1995.

<u>Model</u>	<u>Application</u>	<u>Issued TC</u>	<u>Model</u>	<u>Application</u>	<u>Issued TC</u>
PW4074	20 February 2004	25 August 2004	PW4084D	20 February 2004	25 August 2004
PW4077	20 February 2004	25 August 2004	PW4090	20 February 2004	25 August 2004
PW4084	20 February 2004	25 August 2004	PW4090-3	20 February 2004	25 August 2004
PW4074D	20 February 2004	25 August 2004	PW4090D	20 February 2004	25 August 2004
PW4077D	20 February 2004	25 August 2004	PW4098	20 February 2004	25 August 2004

PRODUCTION BASIS All models: Production Certificate Number 2 (FAA)

NOTES:**NOTE 1** Maximum Permissible Operating Speeds for Engine Rotors:

	PW4074/ PW4077/PW4084	PW4077D/ PW4084D/ PW4090/ PW4074D/ PW4090-3	PW4090D/ PW4098
Low pressure rotor (N1), rpm	2 990	3 045	3 155
High pressure rotor (N2), rpm	10 850	10 850	-
- transient (25 seconds)	-	-	10 850
- steady state	-	-	10 785

Minimum Permissible Operating Speeds for Engine Rotors:

Low pressure rotor (N1), rpm	590 (In-flight)
High pressure rotor (N2), rpm	5 900 (In-flight and on ground operation)

NOTE 2 Maximum Permissible Temperatures:

For in-flight starts, which result in exceedance of the ground start limit, the maximum temperature and duration must be recorded for maintenance action, per the PW4000-112 series Engine Maintenance Manual.

External engine component maximum limiting temperatures are specified in the Installation and Operating Manual, Section 4.3.

Turbine Exhaust gas temperature.

	PW4074/PW4077/ PW4084	PW4077D/PW4084D/ PW4090/PW4074D/ PW4090-3	PW4090D/ PW4098
At takeoff (5 minutes, see Note 18) °C (°F)	625 (1 157)	675 (1 247)	675 (1 247)
Maximum continuous °C (°F)	605 (1 121)	650 (1 202)	617 (1 143)
At start-up			
Ground °C (°F)	535 (995)	535 (995)	535 (995)
In-flight °C (°F)	625 (1 157)	675 (1 247)	675 (1 247)
Oil outlet temperature			
Continuous operation °C (°F)	163 (325)	163 (325)	163 (325)
Transient operation (20 min) °C (°F)	177 (350)	177 (350)	177 (350)

NOTE 3 Fuel Pressure Limits:
At inlet to engine system pump, not less than 5 psig above the true vapor pressure of the fuel and not greater than 70 psig with a vapor/liquid ratio of zero.

Oil Pressure Limits: Minimum 70 psig

Temporary interruption of oil pressure associated with negative "G" operation is limited to 30 seconds maximum.

Normal oil pressure will be restored rapidly once the negative "G" effect has been eliminated. There is no maximum oil pressure limit.

NOTE 4 Maximum Permissible Air Bleed:

5.17 kg/s (11.4 pounds/second) airflow - PW4074, PW4077 and PW4084

4.85 kg/s (10.7 pounds/second) airflow - PW4077D, PW4084D, PW4090, PW4090-3 and PW4074D

4.99 kg/s (11.0 pounds/second) airflow - PW4090D, PW4098

NOTE 5 The Sea Level Static Ratings are ideal and are based on ICAO Standard Atmosphere conditions, a Pratt & Whitney ideal inlet, no fan or compressor air bleed or load on accessory drives, an exhaust system having no internal pressure or external scrubbing losses, and fan duct and primary nozzle velocity coefficients equal to 1.0.

NOTE 6 The following accessory drive provisions are incorporated:

Drive	Rotation	Speed ratio to Turbine Shaft	Torque N.m (lb.in)		Overload	Overhang m.N (inlb)
			Continuous	Static		
High pressure rotor						
Starter	CCW	0.841:1	-	*	-	56.5 (500)
IDGS	CCW	0.841:1	**	1 186.3 (10 500)	**	226.0 (2 000)
Fluid power pump (R)	CCW	0.391:1	169.5 (1 500)	734.4 (6 500)	220.3 (1 950)	45.2 (400)
VSCF	CCW	2.435:1	***	508.4 (4 500)	***	45.2 (400)

NOTE 6 Legend: CCW = counterclockwise

(Cont.)

* Maximum starter continuous torque = 1 423.6 N.m (1 050 lb.ft) at zero rpm and 1 694.8 N.m (1 250 lb.ft) maximum impact torque. Maximum allowable starter torque value is 2 031.0 N.m (1 498 lb.ft) – 2 348.3 N.m (1 732 lb.ft).

** Maximum allowable continuous torque values are equivalent to 243 horsepower at any engine speed at or above sea level idle. The following overload conditions can be accommodated:

<u>Horsepower</u>	<u>Duration Time</u>	<u>Recurring Time</u>
304	5 minutes	1 000 hours
304	5 seconds	1 hour
500	5 seconds	1 000 hours

*** Maximum allowable continuous torque values are equivalent to 58 horsepower at any engine speed at or above sea level idle. The following overload conditions can be accommodated:

<u>Horsepower</u>	<u>Duration Time</u>	<u>Recurring Time</u>
87	5 minutes	1 000 hours
87	5 seconds	1 hour
128	5 seconds	1 000 hours

NOTE 7 Power setting, power checks, and control of engine output in all operations are to be based upon Pratt & Whitney engine charts referring to either turbine discharge section gas pressure or low rotor speed. Pressure probes and a low rotor speed sensor are included in the engine assembly for this reason.

NOTE 8 Lightning protection requirements and electromagnetic interference emitted by the electronic engine control system, including cables, are specified in the Installation and Operating Manual, Section 5.12.

NOTE 9 Fuel and fuel additives conforming to the latest applicable issue of FAA-approved Pratt & Whitney Turbojet Engine Service Bulletin No. 2016 may be used separately or mixed in any proportions without adversely affecting the engine operation or power output.

NOTE 10 The following oils are eligible: Oils conforming to Pratt & Whitney Turbojet Engine Service Bulletin No. 238, latest revision.

NOTE 11 Certain engine parts are life limited. Limits are listed in Pratt & Whitney PW4000-112 series engine Turbofan Engine Manual, Part Number 51A345, time limit section for models PW4074, PW4077 and PW4084 and Part Number 51A751 for models PW4077D, PW4084D, PW4090, PW4090-3, PW4074D, PW4090D and PW4098.

- NOTE 12** Intentionally left blank.
- NOTE 13** The maximum permissible engine inlet distortion limit is specified in the Installation and Operating Manual, Section 5.4, Report PWA-6510-09.
- NOTE 14** Limits regarding transient rotor shaft overspeed rpm and transient gas overtemperature and the number of overtemperature occurrences are specified in the Maintenance Document, Part No. 51A344.
- NOTE 15** Information regarding approved fuel filter and oil filter replacement is in the PW4000 Series Illustrated Parts Catalog, Part Number 51A346 for models PW4074, PW4077 and PW4084 and Part Number 51A742 for models PW4077D, PW4084D, PW4090, PW4090-3, PW4074D, PW4090D and PW4098.
- NOTE 16** Requirements and limitations associated with automatic fuel system anti-icing are specified in the Installation and Operating Manual, Section 5.5, Report PWA-6510-09.
- NOTE 17** The PW4000-112 series engine model engines have been approved to operate with certain faults present in the control system, based on satisfaction of RBHA/FAR 33 requirements and appropriate RBHA/FAR 25 control system reliability requirements. The following criteria exist as dispatch and maintenance requirements for the engine control system. These criteria are specified in Pratt & Whitney Report PWA-6600-05 which defines the various configurations and maximum operating intervals as follows:
- Fault Level A: No dispatch allowed
 - Fault Level B: Dispatchable: maximum operating interval for Fault Level B fault(s) is 20 days.
 - Fault Level D: Unlimited dispatch
- Fault Levels A, B and D: constitute Pratt & Whitney nomenclature. The airframe manufacturers may use different nomenclature in adapting these fault categories to the aircraft maintenance and display systems. However, the maximum operating intervals are restricted as shown above. Fault Level C is not applicable for PW4000-112 series engines.
- A control system reliability monitoring program has been established with Pratt & Whitney in compliance with the reporting requirements as outlined in the Engine and Propeller Directorate Policy, letter dated 28 October 1993, for Time Limited Dispatch of Engine fitted with FADEC Systems.
- NOTE 18** The normal 5 minutes takeoff time limit may be extended to 10 minutes for one engine inoperative contingency.
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NOTE 19 The PW4090-3 engine model provides the same takeoff thrust as the PW4090 engine model up to a 304.8 m (1 000 feet) altitude for all temperature days. Above 304.8 m (1 000 feet) in altitude the PW4090-3 rating provides increased takeoff thrust as a function of both ambient temperature and altitude as shown in the Installation and Operating Manual, Section 4 and Table 1, Report PW-6510-09. Above ambient temperatures of 30 °C (86 °F) the altitude ratings do not exceed that of the sea level rating for the PW4090 and PW4090-3 engine models.

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