



AGÊNCIA NACIONAL DE AVIAÇÃO CIVIL - BRASIL

TYPE CERTIFICATE DATA SHEET Nº EM-2004T04

Type Certificate Holder:

ROLLS-ROYCE DEUTSCHLAND LTD & CO KG
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GERMANY

EM-2004T04-02

Sheet 01

ROLLS-ROYCE
DEUTSCHLAND

BR700-710A1-10
BR700-710C4-11
BR700-710A2-20

March 2007

Engines of models described herein conforming with this data sheet, which is part of Type Certificate No. 2004T04, 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 BR700-710A1-10; BR700-710C4-11, BR700-710A2-20.

TYPE Two spool axial flow engine consisting of a single stage fan, a ten stage axial flow compressor, an annular combustion chamber, a two stage axial flow high pressure turbine, a two stage axial flow low pressure turbine, an accessory gearbox, a thrust reverser and a Full Authority Digital Engine Control (FADEC).

RATINGS (See NOTE 5)	BR700-710A1-10	BR700-710C4-11	BR700-710A2-20
Maximum continuous at sea level, static thrust, kN (lbf)	64.3 (14 450)	64.3 (14 450)	64.3 (14 450)
Take off (5 min. See Note 18) at sea level, static thrust, kN (lbf)	65.6 (14 750)	68.4 (15 385)	65.6 (14 750)

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COMPONENTS (RRD P/N'S)		BR700-710A1-10	BR700-710C4-11	BR700-710A2
	Full Authority Digital Engine Control (FADEC)	EEC P/N 1501KDC01-817 or later approved standards	EEC P/N 1505KDC01-002 or later approved standards	ECC P/N 1520KDC01-605 or later approved standards
FUEL TYPE			See Note 16	
OIL, LUBRICATION			See Note 17	
PRINCIPAL DIMENSIONS	Length, cm (in)	466.9 (183.8)	466.0 (183.5)	466.9 (183.8)
	Diameter, cm (in)	182.0 (071.6)	178.5 (070.3)	182.0 (071.6)
WEIGHT	Dry, kg (lb) ⁽¹⁾	1 851.2 (4 081.2)	1 818.4 (4 008.8)	1 891.0 (4 169.9)
	⁽¹⁾ Weight includes basic engine, basic accessories, and optional equipment as listed in the manufacturer's engine specifications.			
IMPORT REQUIREMENTS	Each engine imported separately and/or spare parts must be accompanied by an export airworthiness approval issued by LBA (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 ANAC approved type design. The ANAC type design corresponds to the LBA approved type design, as stated in ANAC Reports V33-0870-00, original issuance dated 30 September 2004, or further revisions.			
CERTIFICATION BASIS	RBHA 33 corresponding to FAR 33, effective 01 February 1965, including amendment 33-1 through 33-15, RBHA/FAR 33.76 as amendment by 33-20 and RBHA/FAR 33.78 as amendment by 33-19; and RBHA 34 corresponding to FAR 34 and ICAO Annex 16, Volume II, Second Edition, July 1993, including the following items listed in LBA/JAA certification basis and endorsed by:			

CERTIFICATION BASIS (Cont.)	<u>Model BR700-710A1-10</u> Special Condition SC1 "Ingestion of Hail". Special Condition SC2 "Ingestion of Rain". Exemptions: JAR-E 890(a) Engine Calibration in Reverse Thrust. Equivalent Safety Findings: JAR-E 840(a)(2) Rotor Integrity.	<u>Date of Application</u> 08 April 2004	<u>Issued/Amended</u> 30 September 2004
	<u>Model BR700-710C4-11</u> JAR-E, Change 10, E 40(f) Ratings. JAE-E, Change 10, E790 Ingestion of Rain and Hail. Exemptions: JAR-E 890(a) Engine Calibration in Reverse Thrust. Equivalent Safety Findings: JAR-E 840(a)(2) Rotor Integrity.	<u>Date of Application</u> 28 January 2004	<u>Issued/Amended</u> 30 September 2004
	<u>Model BR700-710A2-20</u> Special Condition "Ingestion of Hail". Special Condition "Ingestion of Rain". Exemptions: JAR-E 890(a) Engine Calibration in Reverse Thrust. Equivalent Safety Findings: JAR-E 840(a)(2) Rotor Integrity.	<u>Date of Application</u> 6 April 2006	<u>Issued/Amended</u> 16 October 2006

NOTES:

NOTE 1	<u>Maximum Permissible Engine Rotor Speeds</u>	BR700-710A1-10	BR700-710C4-11	BR700-710A2-20
	Low Pressure Turbine N1 (%)			
	- Maximum Take-off (See NOTE 18)	101.1	--	102.1
	- Maximum Continuous	101.0	--	102.1
	- Maximum Overspeed (20 sec.)	101.5	--	102.5
	- Reverse Thrust (maximum 30 sec.)	70	--	70
	- Acceleration to Takeoff with Cross Winds above 20 kts	66*	--	--
	- Stabilized engine operation is not approved for aircraft static on the ground	between 66 and 80**	--	--
	High Pressure Turbine N2 (%)			
	- Maximum Take-off (See NOTE 18)	99.6	--	--
	- Maximum Continuous	98.9	--	--
	- Maximum Overspeed (20 sec.)	99.8	--	--
	* Until a forward speed of 20 kts is reached. Above 20 kts forward speed, a slam acceleration to take-off is required.			
	** Acceleration or deceleration through this band must not exceed 10 seconds (forward thrust only).			
	100 % N1 equals 7431 RPM 100 % N2 equals 15898 RPM			

NOTE 2	Maximum Permissible Temperatures	BR700-710A1-10	BR700-710C4-11	BR700-710A2-20
	Turbine Gas Temperature (Trimmed) °C (°F)			
	- Takeoff (See NOTE 18)	900 (1652)	--	--
	- Maximum Continuous	860 (1580)	--	--
	- Maximum overtemperature (20 sec.)	905 (1661)	--	--
	- Maximum prior to start	150 (302)	--	--
	- Starting on ground	700 (1292)	--	--
	- Starting in flight	850 (1562)	--	--
	Oil temperatures °C (°F)			
	- Minimum for Starting	-30 (-22)	--	-40 (-40)**
	- Minimum for Acceleration for take-off	20 (68)	--	--
	- Maximum	160 (320)	--	--
	Fuel Temperatures °C (°F)			
	- LP Pump Inlet, Max.	54 (129)	--	--
	- HP Pump Outlet, Max.	158 (316)/165 (329)*	--	--

* Temporarily permitted for a period of not more than 15 minutes.

** For temperatures below -30 °C see OI-710-2BR Operating Instructions.

NOTE 3	Fuel and Oil Pressure Limits
	Fuel and oil pressure limits are the same for both BR700-710A1-10, BR700-710C4-11 and BR700-710A2-20, except where noted.
	Fuel Pressure: Minimum permissible fuel pressure at LP fuel pump inlet: 34.5 kPa/5.0 psig
	Differential Oil Pressures: Minimum Acceptance for Flight in the Range:
	Idle to 72.3% N2: 241.2 kPa/35 psid
	72.3% N2 to 90% N2: straight line interpolation from 241.2 kPa/35 psid to 310.3 kPa/45 psid
	Above 90% N2: 310.3 kPa/45 psid
	Minimum to Complete Flight:
	Idle to 72.3% N2: 172.3 kPa/25 psid
	7 2.3% N2 to 90% N2: straight line interpolation from 172.3 kPa/25 psid to 241.2 kPa/35 psid
	Above 90% N2: 241.2 kPa/35 psid

NOTE 4 Bleed Extraction:

For BR700-710A1-10

Power Range	Normal Flow (%)			Maximum Flow (%)		
	Stage 5	Stage 8	Fan	Stage 5	Stage 8*	Fan
Idle to 1.06 EPR		7.8		3.0	12.1	0.6
1.06 to 1.3 EPR	4.4	4.2	0.2	8.3	7.9	1.6
Above 1.3 EPR	4.3		0.4	8.5	8.0	1.8

For BR700-710C4-11:

Power Range	Normal Flow (%)			Maximum Flow (%)		
	Stage 5	Stage 8	Fan	Stage 5	Stage 8*	Fan
Idle to 1.06 EPR		7.7		3.0	12.0	0.6
1.06 to 1.3 EPR	4.3	4.1	0.2	8.2	7.8	1.6
Above 1.3 EPR	4.2		0.4	8.3	7.8	1.8

For BR700-710A2-20:

Power Range	Normal Flow (%)			Maximum Flow (%)		
	Stage 5	Stage 8	Fan	Stage 5	Stage 8*	Fan
Idle to 1.06 EPR		7.8	0.4	3.0	12.1	0.6
1.06 to 1.3 EPR	4.4	4.2	0.4	8.3	7.9	0.9
Above 1.3 EPR	4.3		0.4	8.5	8.0	1.1

EPR = P50/P20: The amounts of bleed extraction from stages 5 and 8, respectively, are related to the core entry mass flow, W26. The amount of fan bleed extraction is related to the fan entry mass flow, W1A.

* Stage 8 bleed extraction is cleared for operation up to and including the Maximum Continuous rating.

NOTE 5 The ratings are defined at sea level ISA standard day conditions and a defined test bed configuration for the air intake and exhaust systems with all optional bleeds closed and the aircraft service equipment drives unloaded, at a fuel low heat value of 43179 kJ/kg (22721 CHU/kg).

NOTE 6 Accessory Drive Provisions

For BR700-710A1-10:

	Direction of Rotation ⁽¹⁾	Transmission Ratio	Torque daNcm (lbsin)	Weight kg (lb)	Static Overhang Moment daNcm (lbsin)	Maximum Power Extraction kW (hp)
Main Engine Fuel Pump including Fuel Metering Unit	CW	0.530	2670 (2363)	20.5 (45.2)	395.45 (350)	26.9 (36.1)
Hydraulic Pump No. 1	CCW	0.270	4180 (3700)	8.91 (19.64)	81 (71.7)	18.6 (24.9)
Hydraulic Pump No. 2	CCW	0.275	4180 (3700)	8.91 (19.64)	81 (71.7)	18.6 (24.9)
Generator	CW	0.520	4125 (3651)	32.61 (71.9)	564.92 (500)	32.7 (43.9)
Generator FADEC ⁽²⁾	CW	1.998		1.0 (2.2)	10 (8.85)	1.0 (1.34)
Air Turbine Starter	CCW	0.986	8470 (7497)	15.56 (34.3)	227 (201)	
Oil Pump	CCW	0.408	518 (458)	9.07 (20)	66 (58.4)	3.2 (4.3)

⁽¹⁾ CW - Clockwise; CCW - Counterclockwise⁽²⁾ Dedicated Generator (PMA)

For BR700-710C4-11:*

	Direction of Rotation ⁽¹⁾	Transmission Ratio	Torque daNcm (lbsin)	Weight kg (lb)	Static Overhang Moment daNcm (lbsin)	Maximum Power Extraction kW (hp)
Hydraulic Pump No. 2	CCW	0.275	4180 (3700)	8.91 (19.64)	81 (71.7)	18.6 (24.9)
Generator	CW	0.520	4125 (3651)	32.61 (71.9)	565 (500)	32.75 (43.9)

⁽¹⁾ CW - Clockwise; CCW - Counterclockwise

* For Engines with Modification 72-101466 incorporated E-TR0283/06 Issue 01 or later approved issue applies additionally.

NOTE 6 For BR700-710A2-20:

(Cont.)

	Direction of Rotation ⁽¹⁾	Transmission Ratio	Torque daNcm (lbsin)	Weight kg (lb)	Static Overhang Moment daNcm (lbsin)	Maximum Power Extraction kW (hp)
Main Engine Fuel Pump including Fuel Metering Unit	CW	0.530	2670 (2363)	20.5 (45.2)	395.45 (350)	26.9 (36.1)
Hydraulic Pump	CCW	0.335	3051 (2700)	6.57 (14.5)	61 (54)	10.3 (13.8)
Generator No. 1	CW	1.083	2830 (2505)	20.0 (44.2)	325 (287.6)	52 (69.7)
Generator No. 2	CCW	1.080	2830 (2505)	20.0 (44.2)	325 (287.6)	52 (69.7)
Generator FADEC ⁽²⁾	CW	1.998		1.0 (2.2)	10 (8.85)	1.0 (1.34)
Air Turbine Starter	CCW	0.986	8470 (7497)	15.56 (34.3)	227 (201)	
Oil Pump	CCW	0.421	518 (458)	9.07 (20)	66 (58.4)	3.2 (4.3)

⁽¹⁾ CW - Clockwise; CCW – Counterclockwise ⁽²⁾ Dedicated Generator (PMA)

NOTE 7

<u>Operating and Service Instructions:</u>	BR700-710A1-10	BR700-710C4-11
Installation Drawing and Manual	E-TR206/95 Issue 6 or later approved issues	E-TR240/01-(FR)-ISS02 or later approved issues
Operating Instructions	OI-710-1BR	OI-710-4BR
Maintenance Manual	M-710-1BR	M-710-4BR
Engine Manual	E-710-1BR	E-710-4BR
Time Limits Manual	T-710-1BR	T-710-4BR

	BR700-710A2-20
Installation Drawing and Manual	E-TR364/95 Issue 1 or later approved issues
Operating Instructions	OI-710-2BR
Maintenance Manual	M-710-2BR
Engine Manual	E-710-2BR
Time Limits Manual	T-710-2BR

Service bulletins, structural repair manuals, vendor manuals, aircraft flight manuals, and overhaul and maintenance manuals which contain a statement that the document is LBA approved are accepted by the ANAC and considered ANAC approved. These approvals pertain to the type design only.

For BR700-710C4-11 Engines with Modification 72-101466 incorporated E-TR0283/06 Issue 01 or later approved issue and the Service Bulletin SB-BR700-72-101466 apply additionally.

- NOTE 8** The engines are equipped with a thrust reverser:
BR700-710A1-10: P/N 04G0001-039 (left hand engine) and P/N 04G0001-041 (right hand engine) or later approved standards.
BR700-710C4-11: P/N 25G0001-001 (left hand engine) and P/N 25G0001-003 (right hand engine) or later approved standards.
BR700-710A2-20: P/N 07G0001-005 (left hand engine) and P/N 07G0001-007 (right hand engine) or later approved standards.
Operation of these thrust reversers is approved for ground use only. Use for power back is not approved.
- NOTE 9** The BR700-710 series engines meets RBHA requirements for adequate turbine disk integrity and rotor blade containment and does not require external armoring.
Certain engine parts are life limited. These limits are listed in the BR710 Time Limits Manual.
- NOTE 10** FADEC:
BR700-710A1-10: EEC P/N 1501KDC01-817, or later approved standards.
BR700-710C4-11: EEC P/N 1505KDC01-002, or later approved standards.
BR700-710A2-20: EEC P/N 1520KDC01-605, or later approved standards.
The EEC software has been developed and verified in accordance with RTCA/DO-178B respectively ED-12B.
- NOTE 11** Lightning and EMI protection capability of the electronic engine control system are specified in the BR700-710A1-10, BR700-710A2-20 and BR700-710C4-11 Installation Manuals.
- NOTE 12** Reserved.
- NOTE 13** Information on engine operation with FADEC system dispatch limitations is contained in the following report:
E-TR361/96 (FR) Issue 00 or later approved issues for the BR700-710A1-10 and;
E-TR737/96 (FR) Issue 1 or later approved issues for BR700-710A2-20 and;
E-TR043/02-(FR)-ISS02, or later approved issues for the BR700-710C4-11.
- NOTE 14** The engine meets the smoke and hydrocarbon emission requirements of RBHA/FAR 34 and the carbon monoxide and nitrogen oxide requirements of International Civil Aviation Organization Standards.
- NOTE 15** The BR710 engine meets the fuel venting emission requirements of RBHA/FAR 34.
- NOTE 16** Approved fuels and fuel additives are listed in the latest applicable issue of the applicable BR710 Operating Instructions.
For BR700-710C4-11 Engines with Modification 72-101466 incorporated E-TR0283/06 Issue 01 or later approved issue applies additionally.

- NOTE 17** Approved oils are listed in the latest applicable issue of the applicable BR710 Operating Instructions.
For BR700-710C4-11 Engines with Modification 72-101466 incorporated E-TR0283/06 Issue 01 or later approved issue applies additionally.
- NOTE 18** Use of take-off thrust for more than five minutes (not to exceed ten minutes) is approved for use only in the event of an inoperative engine due to shutdown or failure.
- NOTE 19** The maximum permissible engine inlet distortion limit is specified in the applicable BR710 Installation Manual.



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