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## TYPE-CERTIFICATE DATA SHEET

No. E.018

**for**  
BR700-710 engines

### **Type Certificate Holder**

Rolls-Royce Deutschland Ltd & Co KG  
Eschenweg 11, Dahlewitz  
15827 Blankenfelde-Mahlow  
Germany

EASA Design Organisation Approval No: EASA.21J.065

For Models:

BR700-710A1-10  
BR700-710A2-20  
BR700-710C4-11  
BR700-725A1-12



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## **I. General**

### **1. Type/ Model**

Type: BR700-710

Models:

BR700-710A1-10	BR700-710A2-20	BR700-710C4-11	BR700-725A1-12
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These Models are approved for use on multi-engined civil aircraft at the ratings and within the operating limitations specified below, subject to compliance with the powerplant installation requirements appropriate to approved installations.

### **2. Type Certificate Holder**

Rolls-Royce Deutschland Ltd & Co KG  
Eschenweg 11, Dahlewitz  
15827 Blankenfelde-Mahlow  
Germany

**EASA Design Organisation Approval No: EASA.21J.065**

### **2. Manufacturer**

Rolls-Royce Deutschland Ltd & Co KG  
(Formerly Rolls-Royce Deutschland GmbH, formerly BMW Rolls-Royce GmbH)

### **4. Date of Application**

BR700-710A1-10	BR700-710A2-20	BR700-710C4-11	BR700-725A1-12
16 February 1993	23 March 1994	15 January 2001	6 March 2006

### **5. EASA Type Certification Date**

<u>BR700-710A1-10</u> (refer to note 6)	<u>BR700-710A2-20</u> (refer to note 6)	<u>BR700-710C4-11</u> (refer to note 6)	<u>BR700-725A1-12</u>
<u>14 August 1996</u>	<u>28 January 1997</u>	<u>24 June 2002</u>	<u>23 June 2009</u>

### **Certification Reference Date:**

31 August 1993



## **II. Certification Basis**

### **1. EASA Certification Basis**

#### **1.1. Airworthiness Standards**

<b>BR700-710A1-10</b>	<b>BR700-710A2-20</b>	<b>BR700-710C4-11</b>
<p>JAR-E, Change 8 Amendment E/91/1, effective 27.05.1991 Amendment E/93/1, effective 17.05.1993 Emissions and Fuel Venting: ICAO Annex 16, Volume II (Second Edition July 1993) Plus: CS-34 Issue 17.10.2003; ICAO Annex 16, Volume II ( Third Edition, including Amendment 7), Part III, Chapter 2.3.2, e) (CAEP/8)</p>		
<b>none</b>		<p>JAR-E, Change 10, E790 Ingestion of Rain and Hail JAR-E, Change 10, E40(f) Ratings</p>

#### **BR700-725A1-12:**

CS-E, Initial Issue dated 24 October 2003  
E50 and E1030 of CS-E, Amendment 1 dated 10 December 2007  
E1040 of CS-E, Amendment 3

#### **1.2. Special Conditions (SC)**

<b>BR700-710A1-10</b>	<b>BR700-710A2-20</b>	<b>BR700-710C4-11</b>
<p>Ingestion of Hail Ingestion of Rain</p>		<b>none</b>

#### **BR700-725A1-12:**

**none**

#### **1.3. Equivalent Safety Findings**

<b>BR700-710A1-10</b>	<b>BR700-710A2-20</b>	<b>BR700-710C4-11</b>
JAR-E840(a)(2) Rotor Integrity		



**BR700-725A1-12:**

none

**1.4. Deviations**

BR700-710A1-10	BR700-710A2-20	BR700-710C4-11
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JAR-E890(a) Engine Calibration in Reverse Thrust – Exemption

**BR700-725A1-12:**

none

**1.5. Environmental Protection**

**BR700-725A1-12:**

CS-34; ICAO Annex 16, Volume II (Second Edition July 1993, including Amendment 5) dated 24 November 2005. NOx Standard in accordance with Part III, Chapter 2, § 2.3.2 d (CAEP/6)

**III. Technical Characteristics**

**1. Type Design Definition**

The Engine Type Designs are defined in the following Drawing Introduction Sheets (DIS):

BR700-710A1-10	BR700-710A2-20	BR700-710C4-11	BR700-725A1-12
DIS 10002 ISSUE 03 or later approved issues	DIS 10005 ISSUE 02 or later approved issues	DIS 10012 ISSUE 01 or later approved issues	Except for the EEC P/N, which is defined in Chapter III, 7, the build standard is defined in DIS 10016 Issue 1 Revision D or later approved issues

Changes to the Engine Type Design are introduced by approved Modification Bulletins.



## 2. Description

BR700-710A1-10	BR700-710A2-20	BR700-710C4-11	BR700-725A1-12
Two spool axial flow engine consisting of a single stage fan, a ten stage axial flow high pressure compressor, an annular combustion chamber, a two stage axial flow high pressure turbine, a two/three* stage axial flow low pressure turbine, an accessory gearbox, a thrust reverser** and a Full Authority Digital Engine Control (FADEC).			

\* The BR700-710A1-10, BR700-710A2-20 and BR700-710C4-11 feature a two stage axial flow low pressure turbine, while the BR700-725A1-12 features a three stage axial flow low pressure turbine.

\*\* The BR700-725A1-12 is designed for use with a Thrust Reverser, but it is not part of the engine Type Design.

## 3. Equipment

Approved equipment is listed in the following RRD Reports:

BR700-710A1-10	BR700-710A2-20	BR700-710C4-11	BR700-725A1-12
E-TR150/95-(FR), ISSUE 03 'Engine Equipment Classification' or later approved issues	E-TR427/96-(FR), ISSUE 01 'Engine Equipment Classification' or later approved issues	E-TR466/01-(FR), ISSUE 02 'Engine Equipment Classification' or later approved issues	See Installation Manual O-TR1458/08

For details of equipment included in the type design definition: refer to the appropriate engine DIS.

## 4. Dimensions

	BR700-710A1-10	BR700-710A2-20	BR700-710C4-11	BR700-725A1-12
Overall Length	4669 mm	4669 mm	4660 mm	3297 mm (tip of spinner to rear of exhaust cone)
Maximum Diameter (radius)	1820 mm	1820 mm	1785 mm	950 mm (radius from center line measured at the lowest point of AGB)



## 5. Dry Weight

	<b>BR700-710A1-10</b>	<b>BR700-710A2-20</b>	<b>BR700-710C4-11</b>	<b>BR700-725A1-12</b>
Dry engine weight	1851,2 kg	1891,0 kg	1818,4 kg	1635,2 kg

Dry weight includes thrust reverser and dressings for the BR700-710A1-10, BR700-710A2-20 and BR700-710C4-11 and dressings for the BR700-725A1-12, but excludes all fluids and all buyer furnished equipment and in the case of the BR700-725A1-12 also the thrust reverser.

## 6. Ratings

	<b>BR700-710A1-10</b>	<b>BR700-710A2-20</b>	<b>BR700-710C4-11</b>	<b>BR700-725A1-12</b>
Take off	65,6 kN	65,6 kN	68,4 kN	75,2 kN
Maximum Continuous	64,3 kN	64,3 kN	64,3 kN	66,6 kN

See Note 5.

## 7. Control System

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

	<b>BR700-710A1-10</b>	<b>BR700-710A2-20</b>	<b>BR700-710C4-11</b>	<b>BR700-725A1-12</b>
EEC P/N	1501KDC01-817 or later approved standards	1520KDC01-605 or later approved standards	1505KDC01-002 or later approved standards	G3010ECU01AJ or later approved standards

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

Approved fuels, additives and oils are listed in the Operating Instructions





## 9. Aircraft Accessory Drives

<b>BR700-710A1-10</b> (with two hydraulic pumps installed)	Direction of Rotation <sup>1</sup>	Transmission Ratio	Shear Torque [Nm]	Weight [kg]	Static Overhang Moment [Nm]	Maximum Torque Extraction [Nm]
Gear Line 6 Pad (Hydr. Pump 1)	counter-clockwise	0.270	418	8.91	8.1	69
Gear Line 8 Pad (Hydr. Pump 2)	counter-clockwise	0.275	418	8.91	8.1	68
Gear Line 11 Pad (Generator)	clockwise	0.520	412.5	32.61	56.5	106

<b>BR700-710A1-10 &amp; BR700-710C4-11</b>	Direction of Rotation <sup>1</sup>	Transmission Ratio	Shear Torque [Nm]	Weight [kg]	Static Overhang Moment [Nm]	Maximum Torque Extraction [Nm]
Gear Line 8 Pad (Hydraulic Pump)	counter-clockwise	0.275	418	8.91	8.1	86
Gear Line 11 Pad (Generator)	clockwise	0.520	412.5	32.61	56.5	106

<b>BR700-710A2-20</b>	Direction of Rotation <sup>1</sup>	Transmission Ratio	Shear Torque [Nm]	Weight [kg]	Static Overhang Moment [Nm]	Maximum Torque Extraction [Nm]
Gear Line 6 Pad (Hydraulic Pump)	counter-clockwise	0.335	305.1	6.57	6.1	39
Gear Line 8 Pad (Generator No. 2)	counter-clockwise	1.080	283	20.3 <sup>2</sup>	32.5	50
Gear Line 11 Pad (Generator No. 1)	clockwise	1.083	283	20.3 <sup>2</sup>	32.5	50

<b>BR700-725A1-12</b>	Direction of Rotation <sup>1</sup>	Transmission Ratio	Shear Torque [Nm]	Weight [kg]	Contin. Torque [Nm]	Static Overhang Moment [Nm]
Hydr. Pump	clockwise	0.261	406,75	14,55 <sup>2</sup>	120 <sup>3</sup>	16,37
IDG	clockwise	0,522	412,5	32,61 <sup>2</sup>	109 <sup>3</sup>	56,5
ATS	clockwise	0,988	847	9,99 <sup>2</sup>	415	6,76

<sup>3</sup> Further details regarding acceptable loading are defined in the Installation Manual

<sup>1</sup> Looking normal to pad along shaft.

<sup>2</sup> Dry.



## 10. Maximum Permissible Air Bleed Extraction

### BR700-710A1-10, BR700-710A2-20, BR700-710C4-11 :

EPR=P50/P20.

The amounts of bleed extraction from stages 5 and 8, respectively, are related to the core entry mass flow, W26. The amounts of fan bleed extraction are related to the fan entry mass flow, W1A.

Stage 8 bleed extractions are cleared for operation up to and including Maximum Continuous rating.

BR700-710A1-10	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

BR700-710A2-20	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

BR700-710C4-11	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



## BR700-725A-12:

$$NHRT2 = \frac{\text{Mechanical HP Speed [rpm]}}{\sqrt{\text{Engine Inlet Temperature [K]}}} = \frac{NH}{\sqrt{T2}}$$

- Stage 5 and stage 8 HP compressor customer bleed is expressed as a percentage of HP compressor entry mass flow W26.
- Fan bleed flow is expressed as percentage of the fan tip entry mass flow W12.
- Further details regarding acceptable conditions for customer bleed air extractions are defined in the installation Manual

HP Bleed Stage 5			
Nominal		Maximum	
NHRT2	% W26	NHRT2	% W26
Idle – 675	6.5	Idle – 700	7.7
675 – 850	10.1	700 – 875	10.1
850 – MTO	6.5	875 – MTO	8.6

HP Bleed Stage 8			
Nominal		Maximum	
NHRT2	% W26	NHRT2	% W26
Idle – 790	13.6	Idle – 800	14.1
790 – MTO	9.3	800 – MTO	13.6

LP(Fan) Bleed			
Nominal		Maximum	
NHRT2	% W12	NHRT2	% W12
Idle – 700	1.4	Idle – 720	1.5
700 – 775	1.7	720 – MTO	1.9
775 - MTO	1.7		



## **IV. Operating Limitations**

### **1. Temperature Limits**

Gas Temperatures TGT (trimmed):

	<b>BR700-710A1-10</b>	<b>BR700-710A2-20</b>	<b>BR700-710C4-11</b>	<b>BR700-725A1-12</b>
Maximum prior to starting on ground	150 °C			150°C
Starting on ground	700 °C			700°C
Starting in flight	850 °C			850°C
Take-off <sup>3</sup>	900 °C			900°C
Maximum Continuous	860 °C			885°C
Maximum Overtemperature (20sec.)	905 °C			920°C (see Note 7)

Fuel Temperatures:

	<b>BR700-710A1-10</b>	<b>BR700-710A2-20</b>	<b>BR700-710C4-11</b>	<b>BR700-725A1-12 **</b>
LP Pump Inlet, maximum	54 °C			
LP Pump Inlet, 51000ft				47°C
Min. fuel temp.				-40°C within the Take-Off envelope/ -45°C outside the Take-Off envelope

\*\* The max. engine fuel inlet temperatures at altitude below 51000ft are derived by linear interpolation between the values given for sea level and 51000ft.

Oil Temperatures:

	<b>BR700-710A1-10</b>	<b>BR700-710A2-20</b>	<b>BR700-710C4-11</b>	<b>BR700-725A1-12</b>
Minimum for starting	-30 °C	-40 °C <sup>4</sup>	-30 °C	-40°C
Minimum for acceleration to Take-off	20 °C			
Maximum	160 °C			

<sup>3</sup> Limited to 5 minutes and to maximum 10 minutes after one engine having failed.

<sup>4</sup> For temperatures below -30 °C see OI-710-2BR Operating Instructions.



## 2. Speed Limits

### Low Pressure Turbine N1:

	BR700-710A1-10 <sup>5</sup>	BR700-710A2-20 <sup>5</sup>	BR700-710C4-11 <sup>5</sup>	BR700-725A1-12 <sup>7</sup>
Maximum Take-off	101.1 %	102.1 %	101.1 %	102,8 %
Maximum Continuous	101.0 %	102.1 %	101.0 %	102,8 %
Maximum Overspeed (20 sec.)	101.5 %	102.5 %	101.5 %	104,3 %
Reverse Thrust (maximum 30 sec.)	70.0 %			78,1%

### High Pressure Turbine N2<sup>6</sup>:

	BR700-710A1-10	BR700-710A2-20	BR700-710C4-11	BR700-725A1-12
Maximum Take-off	99.6%			100.0 %
Maximum Continuous	98.9%			98.7 %
Maximum Overspeed (20 sec.)	99.8%			101.3 %

## 3. Pressure Limits

### 3.1 Fuel Pressure

Fuel Pressures:

	BR700-710A1-10	BR700-710A2-20	BR700-710C4-11	BR700-725A1-12
Minimum at LP Pump Inlet	34.5 kPa			

<sup>5</sup> 100% N1 equals 7431 min<sup>-1</sup>

<sup>6</sup> 100% N2 equals 15898 min<sup>-1</sup>

<sup>7</sup> 100% N1 equals 7000 min<sup>-1</sup>



### 3.2 Oil Pressure

Differential Oil Pressures:

Lower limit for flight in the range	BR700-710A1-10	BR700-710A2-20	BR700-710C4-11	BR700-725A1-12
Idle to 72.3% N2	241.2 kPa			
72.3% N2 to 90% N2	Straight line interpolation form 241.2 kPa to 310.3 kPa			
Above 90% N2	310.3 kPa			

Minimum to complete flight in the range	BR700-710A1-10	BR700-710A2-20	BR700-710C4-11	BR700-725A1-12
Idle to 72.3% N2	172.3 kPa			
72.3% N2 to 90% N2	Straight line interpolation form 172.3 kPa to 241.2 kPa			
Above 90% N2	241.2 kPa			

#### 4. Installation Assumptions:

Refer to Installation Manuals for details.

#### 5. Time Limited Dispatch:

Information on engine operation with FADEC system dispatch limitations is contained in the respective Time Limits Manuals.

#### 6. ETOPS Capability:

The BR700-725A1-12 engine is approved for ETOPS capability in accordance with CS-E1040 amendment 3 by EASA Approval 10059805 for a Maximum Approved Diversion Time of 180 minutes at Maximum Continuous thrust (see also Note 10). This approval does not constitute an approval to conduct ETOPS operations.



## **V. Operating and Service Instructions**

	<b>BR700-710A1-10</b>	<b>BR700-710A2-20</b>	<b>BR700-710C4-11</b>	<b>BR700-725A1-12</b>
Installation Manual	E-TR206/95 Issue 6 or later approved issues	E-TR364/95 Issue 1 or later approved issues	E-TR240/01(FR) ISS02 or later approved issues	O-TR1458/08 Issue 2 or later approved issues
Operating Instructions	OI-710-1BR	OI-710-2BR	OI-710-4BR	OI-725-7BR
Maintenance Manual	M-710-1BR	M-710-2BR	M-710-4BR	M-725-7BR
Engine Manual	E-710-1BR	E-710-2BR	E-710-4BR	E-725-7BR
Time Limits Manual	T-710-1BR	T-710-2BR	T-710-4BR	T-725-7BR
Service Bulletins	As issued by Rolls-Royce Deutschland Ltd & Co KG.			

For BR700-710C4-11 Engines with Modification 72-101466 incorporated E-TR0283/06 Issue01 or later approved issue and the Service Bulletin SB-BR700-72-101466 apply additionally.

## **VI. Notes**

1. The engines are equipped with a thrust reverser:

	<b>BR700-710A1-10</b>	<b>BR700-710A2-20</b>	<b>BR700-710C4-11</b>	<b>BR700-725A1-12</b>
Left hand engine	P/N04G0001-039 or later approved standards	P/N07G0001-005 or later approved standards	P/N25G0001-001 or later approved standards	P/N RD00103001-1 or later approved standards
Right hand engine	P/N04G0001-041 or later approved standards	P/N07G0001-007 or later approved standards	P/N25G0001-003 or later approved standards	P/N RD00103001-2 or later approved standards
Operation of these thrust reversers is approved for ground use only.				
Power back is <u>prohibited</u> .				

2. Life limited critical parts are included in the respective Time Limits Manuals.
3. The EEC software has been developed and verified in accordance with RTCA/DO-178B respectively ED-12B, Level A
4. Information on lightning protection and electromagnetic compatibility is contained in the Installation Manuals.
5. The ratings shown under III.6. are achieved at sea level and ISA standard day conditions using a defined test bed configuration for the air intake and exhaust system with all optional bleeds closed and the aircraft service equipment drives unloaded, at a lower fuel heating value of 43179 kJ/kg [22721 CHU/kg]. The take-off rating and associated



operating limitations may be used for up to 10 minutes in the event of an engine failure or shut down.

6. Models BR700-710A1-10, BR700-710A2-20, BR700-710C4-11 were previously covered under LBA Engine Type Certificate 6305 and Type Certificate Data Sheets 6305 (BR700-710A1-10 at Issue 7, BR700-710A2-20 at Issue 6, BR700-710C4-11 at Issue 1) prior to being superseded by the EASA Type Certificate and Type Certificate Data Sheet.
7. The BR700-725A1-12 engine is approved for a maximum exhaust gas over temperature of 920°C for inadvertent use for periods up to 20 seconds without requiring maintenance action. The cause of the over temperature must be investigated and recorded.
8. The BR700-725A1-12 engine is approved for ground operation in freezing fog conditions down to minus 20°C.
9. Models BR700-710A1-10, BR700-710A2-20, BR700-710C4-11 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. BR700-725A1-12 Engines, approved for 180 minute ETOPS Operation must have the following Modifications incorporated:

Modification	Description
71-101736	POWER PLANT - ENG LT EEC LANE 'A' E2-A LOOM "1A" ELECTRICAL HARNESS-INTRODUCTION OF REVISED HARNESS ROUTING AT THE TRU GUSSET
73-101707	ENGINE FUEL AND CONTROL - FUEL METERING UNIT - INTRODUCTION OF MODIFIED SERVO AND SPILL VALVES AND AN EXTRACTION FEATURE ON THE FUEL RETURN TO TANK SOLENOID
73-101717	ENGINE FUEL AND CONTROL - DATA ENTRY PLUG - INTRODUCTION OF A NEW IDENTIFICATION PLATE
73-101732	ENGINE FUEL AND CONTROL - FUEL MANIFOLD - RE-INTRODUCTION OF THE BASE LINE STANDARD OF FLEXIBLE FUEL PIPES
79-101692	OIL - FUEL COOLED OIL COOLER - INTRODUCTION OF THE PRODUCTION STANDARD OF COOLER WITH IMPROVED ANTI-ICING PROTECTION
80-101678	STARTING - STARTER AIR VALVE - INTRODUCTION OF A NEW STANDARD OF STARTER AIR VALVE





## **SECTION: ADMINISTRATIVE**

### **I. Acronyms and Abbreviations**

n/a

### **II. Type Certificate Holder Record**

n/a

### **III. Change Record**

<b>Issue</b>	<b>Date</b>	<b>Changes</b>	<b>TC issue</b>
Issue 01	20 July 2006	Initial Issue	20 July 2006
Issue 02	23 June 2009	BR700-725A1-12 certification	
Issue 03	27 April 2011	Major Changes Approval 10034743 and 10034748	
Issue 04	21 May 2012	Major Change Approval 10039751	
Issue 05	03 July 2012	Increased Torque Load IDG Customer bleed extraction limitations	
Issue 06	04 January 2013	Major Change Approval 10047087	
Issue 07	15 November 2013	VEG Weight Limit Change	
Issue 08	26 October 2016	ETOPS Capability	
Issue 09	15 February 2017	Temperature Limit for Freezing Fog Operation	
Issue 10	27 March 2017	TCDS number in document header	

-END-

