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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  
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  
BR700-710D5-21



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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 | BR700-710D5-21 |
|----------------|----------------|----------------|----------------|----------------|

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  
15827 Blankenfelde-Mahlow  
Germany

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

### **3. Manufacturer**

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

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

|                       |                       |                       |                       |                       |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| <b>BR700-710A1-10</b> | <b>BR700-710A2-20</b> | <b>BR700-710C4-11</b> | <b>BR700-725A1-12</b> | <b>BR700-710D5-21</b> |
| 16 February 1993      | 23 March 1994         | 15 January 2001       | 6 March 2006          | 12 December 2012      |

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

|  |  |  |                       |                       |
|--|--|--|-----------------------|-----------------------|
| <b>BR700-710A1-10</b><br>(refer to note 6) | <b>BR700-710A2-20</b><br>(refer to note 6) | <b>BR700-710C4-11</b><br>(refer to note 6) | <b>BR700-725A1-12</b> | <b>BR700-710D5-21</b> |
| 14 August 1996                             | 28 January 1997                            | 24 June 2002                               | 23 June 2009          | 28 February 2018      |

### **Certification Reference Date:**

31 August 1993 for BR700-710A1-10, BR700-710A2-20, BR700-710C4-11, BR700-725A1-12  
28 February 2015 for BR700-710D5-21



## **II. Certification Basis**

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

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

##### **BR700-710A1-10 and BR700-710A2-20:**

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)

##### **BR700-710C4-11:**

JAR-E, Change 8  
Amendment E/91/1, effective 27.05.1991  
Amendment E/93/1, effective 17.05.1993  
JAR-E, Change 10, E790 Ingestion of Rain and Hail  
JAR-E, Change 10, E40(f) Rating  
Emissions and Fuel Venting: ICAO Annex 16, Volume II (Second Edition July 1993)

##### **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

##### **BR700-710D5-21:**

CS-E, Amendment 4 dated 12 March 2015 for the engine  
JAR-E, change 8 plus Amendments E/91/1 and E/93/1 for the Thrust Reverser

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

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

##### **BR700-725A1-12 and BR700-710D5-21:**

None



### 1.3. Equivalent Safety Findings

| BR700-710A1-10                 | BR700-710A2-20 | BR700-710C4-11 |
|--------------------------------|----------------|----------------|
| JAR-E840(a)(2) Rotor Integrity |                |                |

**BR700-725A1-12:** None

**BR700-710D5-21:** CS-E740(b)(1) Endurance Test Schedule  
CS-E790(a)(1) Large Hailstone Ingestion

### 1.4. Deviations

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

**BR700-725A1-12 and BR700-710D5-21:**  
None

### 1.5. Environmental Protection

**BR700-710A1-10:**

CS-34 as issued by EASA Decision No. 2003/3/RM of the Executive Director of the Agency dated 17 October 2003 in accordance with environmental protection requirements, ICAO Annex 16 Volume II Amendment 7 applicable 17 November 2011. NOx standard in accordance with ICAO Annex 16 Volume II, Part III, Chapter 2, paragraph 2.3.2 e) (CAEP/8).

**BR700-710A2-20 and BR700-710C4-11:**

CS-34 Amendment 3 as implemented by ED Decision 2019/014/R (29th July 2019), ICAO Annex 16 Volume II, Amendment 9 applicable 1st January 2018 as implemented into EU legislation 11/09/2018. 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.

**BR700-725A1-12:**

CS-34 Amendment 3 as implemented by ED Decision 2019/014/R (29th July 2019), ICAO Annex 16 Volume II, Amendment 9 applicable 1st January 2018 as implemented into EU legislation 11/09/2018. NOx standard in accordance with ICAO Annex 16 Volume II, Part III, Chapter 2, § 2.3.2 d) (CAEP/6) Maximum nvPM mass concentration levels in compliance with Part III, Chapter 4, paragraph 4.2.2 (CAEP/10) of the above mentioned Annex.



**BR700-710D5-21:**

CS-34 Amendment 3 as implemented by ED Decision 2019/014/R (29th July 2019), ICAO Annex 16 Volume II, Amendment 9 applicable 1st January 2018 as implemented into EU legislation 11/09/2018. 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.

**III. Technical Characteristics**

**1. Type Design Definition**

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

| <b>BR700-710A1-10</b>                       | <b>BR700-710A2-20</b>                       | <b>BR700-710C4-11</b>                       | <b>BR700-725A1-12</b>  | <b>BR700-710D5-21</b>                        |
|---|---|---|--|--|
| 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 | DIS 10018, Issue 04 or later approved issues |

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

**2. Description**

| <b>BR700-710A1-10</b>  | <b>BR700-710A2-20</b> | <b>BR700-710C4-11</b> | <b>BR700-725A1-12</b> | <b>BR700-710D5-21</b> |
|--|-----------------------|-----------------------|-----------------------|-----------------------|
| 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 and BR700-710D5-21 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   | BR700-710D5-21   |
|---|---|---|--|--|
| E-TR150/95-(FR),<br>ISSUE 03 'Engine<br>Equipment<br>Classification'<br>or later approved<br>issues | E-TR427/96-(FR),<br>ISSUE 01 'Engine<br>Equipment<br>Classification'<br>or later<br>approved issues | E-TR466/01-(FR),<br>ISSUE 02 'Engine<br>Equipment<br>Classification'<br>or later approved<br>issues | See Installation<br>Manual<br>O-TR1458/08<br>or later approved<br>issues | See Installation<br>Manual<br>EDNS<br>01000373100/006<br>or later approved<br>issues |

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   | BR700-710D5-21  |
|------------------------------|----------------|----------------|----------------|--|---|
| Overall Length               | 4669 mm        | 4669 mm        | 4660 mm        | 3297 mm<br>(tip of spinner to<br>rear of exhaust<br>cone)                          | 4809 mm<br>(tip of spinner to<br>rear of thrust<br>reverser)          |
| Maximum<br>Diameter (radius) | 1820 mm        | 1820 mm        | 1785 mm        | 950 mm<br>(radius from<br>center line<br>measured at the<br>lowest pont of<br>AGB) | 980 mm (radius<br>from centreline<br>measured to the<br>drains plate) |



## 5. Dry Weight

| <b>BR700-710A1-10</b> | <b>BR700-710A2-20</b> | <b>BR700-710C4-11</b> | <b>BR700-725A1-12</b> | <b>BR700-710D5-21</b> |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 1851,2 kg             | 1891,0 kg             | 1818,4 kg             | 1635,2 kg             | 1828,8 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> | <b>BR700-710D5-21</b> |
|--------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Take off           | 65,6 kN               | 65,6 kN               | 68,4 kN               | 75,2 kN               | 67,8 kN               |
| Maximum Continuous | 64,3 kN               | 64,3 kN               | 64,3 kN               | 66,6 kN               | 63,4 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>                       | <b>BR700-710D5-21</b>                       |
|---------|--|--|--|---|---|
| EEC P/N | 1501KDC01-817<br>or later approved standards | 1520KDC01-605<br>or later approved standards | 1505KDC01-002<br>or later approved standards | G3010ECU01AJ<br>or later approved standards | G3020ECU01AE<br>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><br>(with two hydraulic pumps installed) | Direction of Rotation <sup>1</sup> | Transmission Ratio | Shear Torque<br>[Nm] | Weight<br>[kg] | Static Overhang Moment<br>[Nm] | Maximum Torque Extraction<br>[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<br>[Nm] | Weight<br>[kg] | Static Overhang Moment<br>[Nm] | Maximum Torque Extraction<br>[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<br>[Nm] | Weight<br>[kg]    | Static Overhang Moment<br>[Nm] | Maximum Torque Extraction<br>[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<br>[Nm] | Weight<br>[kg]     | Contin. Torque<br>[Nm] | Static Overhang Moment<br>[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.



**BR700-710D5-21**

| Pad          | Direction of Rotation | Gear Ratio to N2 | Max wet Overhung Moment [Nm] | Shear Neck Value [Nm] | Maximum Torque [Nm] | Weight dry [kg] |
|--------------|-----------------------|------------------|------------------------------|-----------------------|---------------------|-----------------|
| EDP          | CCW                   | 0,2778           | 9,5                          | 305,1                 | 50,8*               | 8,48            |
| VFG Pad 1, 4 | CCW                   | 0,8594           | 22,03                        | 293 highest           | 50,0*               | 20,29           |
| VFG Pad 2, 3 | CW                    | 0,8978           | 22,03                        | 293 highest           | 50,0*               | 20,29           |

\* Further details regarding acceptable loading are defined in the Installation Manual.

**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.

| Power Range      | Normal Flow [%] |              |              | Maximum Flow [%] |         |     |
|------------------|-----------------|--------------|--------------|------------------|---------|-----|
|                  | Stage 5         | Stage 8      | Fan          | Stage 5          | Stage 8 | Fan |
| Idle to 1.06 EPR | <del>X</del>    | 7.8          | <del>X</del> | 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             | <del>X</del> | 0.4          | 8.5              | 8.0     | 1.8 |

| Power Range      | Normal Flow [%] |              |     | Maximum Flow [%] |         |     |
|------------------|-----------------|--------------|-----|------------------|---------|-----|
|                  | Stage 5         | Stage 8      | Fan | Stage 5          | Stage 8 | Fan |
| Idle to 1.06 EPR | <del>X</del>    | 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             | <del>X</del> | 0.4 | 8.5              | 8.0     | 1.1 |



| Power Range      | Normal Flow [%] |         |     | Maximum Flow [%] |         |     |
|------------------|-----------------|---------|-----|------------------|---------|-----|
|                  | Stage 5         | Stage 8 | Fan | Stage 5          | Stage 8 | Fan |
| Idle to 1.06 EPR | X               | 7.7     | X   | 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             | X       | 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   |            |       |



### BR700-710D5-21:

#### Allowable Nominal bleed flows

| Bleed Stage | Unit   | Idle ≤ NHRT2 ≤ 980 | NHRT2 > 980 |
|-------------|--------|--------------------|-------------|
| Fan         | %W020A | 0,5                | 0,6         |
| HPC stage 4 | %W026  | 1,6                | 5,6         |
| or          |        |                    |             |
| HPC stage 7 | %W026  | 9,9                | 9,2         |

#### Allowable Maximum bleed flows

| Bleed Stage | Unit   | Idle ≤ NHRT2 ≤ 980 | NHRT2 > 980 |
|-------------|--------|--------------------|-------------|
| Fan         | %W020A | 0,5                | 0,6         |
| HPC stage 4 | %W026  | 1,6                | 7,3         |
| or          |        |                    |             |
| HPC stage 7 | %W026  | 11,7               | 10,8        |

A constant percentage of 1.6%W026 is supplied by HPC stage 4 bleed across the full NHRT2 range. For NHRT2 ≤ 980 only stage 7 bleed can be extracted up to the illustrated levels in addition to the stated 1.6%W026 supplied by HPC stage 4 bleed. For NHRT2 > 980 either HPC stage 4 or stage 7 can be extracted up to the illustrated levels. Simultaneous extraction of HPC stage 4 beyond the stated 1.6%W026 and stage 7 bleed is not permitted.

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

Stage 4 and stage 7 HP compressor customer bleed is expressed as a percentage of HP compressor entry mass flow W026.

Fan bleed flow is expressed as percentage of the total fan face entry mass flow W020A.

Further details regarding acceptable conditions for customer bleed air extractions are defined in the Installation Manual.

## IV. Operating Limitations

### 1. Temperature Limits

Gas Temperatures TGT (trimmed):

|                                     | BR700-710A1-10<br>BR700-710A2-20<br>BR700-710C4-11 | BR700-725A1-12 | BR700-710D5-21     |
|-------------------------------------|--|----------------|--------------------|
| Maximum prior to starting on ground | 150 °C   | 150°C          | 150°C              |
| Starting on ground                  | 700 °C   | 700°C          | 700°C              |
| Starting in flight                  | 850 °C   | 850°C          | 850°C              |
| Take-off <sup>3</sup>               | 900 °C   | 900°C          | 890°C              |
| Take-off (transient 2 min.)         | N/A  | N/A            | 900°C              |
| Maximum Continuous                  | 860 °C   | 885°C          | 850°C              |
| Maximum Overtemperature (20 sec)    | 905°C  | 920°C          | 915°C (see note 7) |

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



Fuel Temperatures:

|                        | BR700-710A1-10       | BR700-710A2-20 | BR700-710C4-11                          | BR700-725A1-12**<br>BR700-710D5-21   |
|------------------------|----------------------|----------------|---|--|
| LP Pump Inlet, maximum | 54 °C (at sea level) |                | +47°C (at 51,000 ft) for BR700-710D5-21 |  |
| LP Pump Inlet, 51000ft |                      |                |   | 47°C   |
| Min. fuel temp.        |                      |                |   | -40°C within the Take-Off envelope/<br>-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:

|                                      | BR700-710A1-10 | BR700-710A2-20      | BR700-710C4-11 | BR700-725A1-12<br>BR700-710D5-21 |
|--------------------------------------|----------------|---------------------|----------------|----------------------------------|
| Minimum for engine starting          | -30 °C         | -40 °C <sup>3</sup> | -30 °C         | -40°C                            |
| Minimum for acceleration to Take-off | 20 °C          |                     |                |                                  |
| Maximum for unrestricted use         | 160 °C         |                     |                |                                  |

## 2. Speed Limits

### Low Pressure Turbine N1:

|                                  | BR700-710A1-10 <sup>4</sup> | BR700-710A2-20 <sup>4</sup> | BR700-710C4-11 <sup>4</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%                       |

<sup>3</sup> For temperatures below -30 °C see OI-710-2BR Operating Instructions.

<sup>4</sup> 100% N1 equals 7431 min<sup>-1</sup>

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



|                                     | <b>BR700-710D5-21<sup>8</sup></b> |
|-------------------------------------|-----------------------------------|
| <b>Maximum Take-off</b>             | <b>102.1 %</b>                    |
| Maximum Continuous                  | 102.1 %                           |
| Maximum Overspeed<br>(20 sec.)      | 103.3 %                           |
| Reverse Thrust<br>(maximum 30 sec.) | 70.4 %                            |

### High Pressure Turbine N2<sup>5</sup>:

|                                | <b>BR700-710A1-10<br/>BR700-710A2-20<br/>BR700-710C4-11</b> | <b>BR700-725A1-12</b> | <b>BR700-710D5-21<sup>9</sup></b> |
|--------------------------------|---|-----------------------|-----------------------------------|
| Maximum Take-off               | 99.6%   | 100.0 %               | 101,6%                            |
| Maximum Continuous             | 98.9%   | 98.7 %                | 99,9%                             |
| Maximum Overspeed<br>(20 sec.) | 99.8%   | 101.3 %               | 102,8%                            |

<sup>8</sup> 100% N1 equals 7431 rpm

<sup>9</sup> 100%N2 equals 19000 rpm

## 3. Pressure Limits

### 3.1 Fuel Pressure

Fuel Pressures:

|                          | <b>BR700-710A1-10 BR700-710A2-20 BR700-710D5-21<br/>BR700-710C4-11 BR700-725A1-12</b> |
|--------------------------|---|
| Minimum at LP Pump Inlet | 34.5 kPa  |

<sup>5</sup> 100% N2 equals 15898 min<sup>-1</sup>



### 3.2 Oil Pressure

Differential Oil Pressures:

| Lower limit for flight in the range | BR700-710A1-10  | BR700-710C4-11 | BR700-710D5-21 |
|-------------------------------------|---|----------------|----------------|
|                                     | BR700-710A2-20  | 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  | BR700-710C4-11 | BR700-710D5-21 |
|---|---|----------------|----------------|
|   | BR700-710A2-20  | 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 Engine Operating Instructions and 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

| Manuals                | BR700-710A1-10                                       | BR700-710A2-20                                       | BR700-710C4-11   | BR700-725A1-12  |
|------------------------|--|--|--|---|
| Installation Manual    | E-TR206/95<br>Issue 6<br>or later approved<br>issues | E-TR364/95<br>Issue 1<br>or later approved<br>issues | E-TR240/01(FR)<br>ISS02<br>or later approved<br>issues | O-TR1458/08<br>Issue 2<br>or later approved<br>issues |
| Operating Instructions | OI-710-1BR   | OI-710-2BR   | OI-710-4BR   | OI-725-7BR  |
| <b>ICA</b>             |  |  |  |   |
| 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.    |  |  |   |

| Manuals                | BR700-710D5-21                                       |
|------------------------|--|
| Installation Manual    | EDNS 01000373100/008 or later approved<br>issues     |
| Operating Instructions | OI-710-8BR   |
| <b>ICA</b>             |  |
| Maintenance Manual     | M-710-8BR  |
| Engine Manual          | E-710-8BR  |
| Time Limits Manual     | T-710-8BR  |
| Service Bulletins      | As issued by Rolls-Royce Deutschland Ltd & Co<br>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

- The engines are equipped with a thrust reverser:

|  | BR700-710A1-10                                   | BR700-710A2-20                                   | BR700-710C4-11                                   | BR700-725A1-12                                     | BR700-710D5- 21                                   |
|--|--|--|--|--|---|
| Left hand engine   | P/N04G0001-039<br>or later approved<br>standards | P/N07G0001-005<br>or later approved<br>standards | P/N25G0001-001<br>or later approved<br>standards | P/N RD00103001-1<br>or later approved<br>standards | P/N 29G0001-021<br>or later approved<br>standards |
| Right hand engine  | P/N04G0001-041<br>or later approved<br>standards | P/N07G0001-007<br>or later approved<br>standards | P/N25G0001-003<br>or later approved<br>standards | P/N RD00103001-2<br>or later approved<br>standards | P/N 29G0001-023 or<br>later approved<br>standards |
| Operation of these thrust reversers is approved for ground use only. |  |  |  |  |   |
| Power back is <u>prohibited</u> .                                    |  |  |  |  |   |

- The EASA approved Airworthiness Limitation Section of the Instructions for Continued Airworthiness is published in the applicable Time Limits Manual.
- 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, BR700-710D5-21 engine 915°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, BR700-710D5-21 down to minus 19°C.
9. Deleted (refer to section 1.5 Environmental Protection).
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 TRUGUSSET                                 |
| 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   |

11. "Pearl 15" is the marketing name for the BR700-710D5-21 engine model



**SECTION: ADMINISTRATIVE**

**I. Acronyms and Abbreviations**

n/a

**II. Type Certificate Holder Record**

n/a

**III. Change Record**

| Issue    | Date             | Changes  | TC issue         |
|----------|------------------|--|------------------|
| Issue 01 | 20 July 2006     | Initial Issue  | 20 July 2006     |
| Issue 02 | 23 June 2009     | BR700-725A1-12 certification   | 23 June 2009     |
| Issue 03 | 27 April 2011    | BR700-725A1-12 Operating Limitations - Major Changes Approval 10034743, Time Limit Dispatch - Major Changes Approval 10034748 and Minimum Starting temperature - Major Changes Approval 10034333                   |                  |
| Issue 04 | 21 May 2012      | BR700-725A1-12 EEC Minimum Standard - Major Change Approval 10039751   |                  |
| Issue 05 | 03 July 2012     | Increased Torque Load IDG - Major Change Approval 10040434<br>Customer bleed extraction limitations – Major Change Approval 10040435   |                  |
| Issue 06 | 04 January 2013  | Change of Environmental Protection Certification Basis - Major Change Approval 10042670  |                  |
| Issue 07 | 15 November 2013 | VFG Weight Limit Change - Major Change Approval 10047087   |                  |
| Issue 08 | 26 October 2016  | BR700-725A1-12 ETOPS Capability - Major Change Approval 10059805   |                  |
| Issue 09 | 15 February 2017 | BR700-725A1-12 Temperature Limit for Freezing Fog Operation - Major Change Approval 10061036   |                  |
| Issue 10 | 27 March 2017    | TCDS number in document header   |                  |
| Issue 11 | 28 February 2018 | Model BR700-710D5-21 added   | 28 February 2018 |
| Issue 12 | 13 June 2018     | Correction to table in section III. 2.   |                  |
| Issue 13 | 03 June 2019     | Re-Certification to CS-E Amendment 4. Major Changes Approval 10069580, 10067649, 10069550 and 10067705 included.   |                  |
| Issue 14 | 05 December 2019 | BR700-710D5-21 to add latest DIS Issue 4, Engine Manual E-710-8BR - Major Change Approval 10071884, new EEC P/N - Major Change Approval 10070971 and CAEP/10 - Major Change Approval 10071907, 10071908, 10071910. |                  |

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