Civil Aviation Authority
United Kingdom

TYPE-CERTIFICATE DATA SHEET

UK.TC.E.00060

for

RB211 Trent 700 Series engines

Type Certificate Holder

Rolls-Royce Deutschland Ltd & Co KG

Eschenweg 11

Dahlewitz

15827 Blankenfelde-Mahlow

Germany

Model(s):	RB211 Trent 768-60 RB211 Trent 772-60 RB211 Trent 772B-60 RB211 Trent 772C-60
Issue:	1
Date of issue:	23 December 2022

TABLE OF CONTENTS

Section 1 General (All Models)

I. General

This Type-Certificate Data Sheet (TCDS) is the concise definition of the type-certificated product accepted and or approved by the CAA in the UK for the affected types and models.

This TCDS includes:

1. Details of the type design that affect the TCDS that have been approved or accepted by the CAA in the UK from 01 January 2021.

2. Details of the type design that affected the TCDS and were approved or accepted by EASA before 01 January 2021, and were incorporated into EASA TCDS EASA.E.042 at Issue 06 dated 20 December 2019 and are therefore accepted by the UK under Article 15 of Annex 30 of the UK-EU Trade and Cooperation Agreement.

Section 2 RB211 Trent 700

I. General

1. Type / Variant or Model

RB211 Trent 700 / RB211 Trent 768-60, RB211 Trent 772-60, RB211 Trent 772B-60, RB211 Trent 772C-60.

2. Type Certificate Holder

Rolls-Royce Deutschland Ltd & Co KG
Eschenweg 11
Dahlewitz
15827 Blankenfelde-Mahlow Germany
DOA ref.: EASA.21J.065

3. Manufacturer

Rolls-Royce plc

4. Date of Application at EASA (Certificating Authority)

Model	Application Date
RB211-Trent 768-60	30 June 1991
RB211-Trent 772-60	30 June 1991
RB211-Trent 772B-60	26 August 1997
RB211-Trent 772C-60	06 May 2005

5. Type Certification date at EASA (Certificating Authority)

Model	EASA Certification Date
RB211-Trent 768-60	24 January 1994
RB211-Trent 772-60	18 March 1994
RB211-Trent 772B-60	11 September 1997
RB211-Trent 772C-60	06 March 2006

See note 11

II. Certification Basis

1. Reference Date for determining the applicable airworthiness requirements

30 June 1991

2. State of Design Airworthiness Authority Type Certification Data Sheet Number

EASA.E.042

3. State of Design Airworthiness Authority Certification Basis

Refer to TCDS EASA.E.042.

4. UK CAA Certification Basis

4.1 Airworthiness Standards

Model	Airworthiness Standards
RB211-Trent 768-60	JAR-E, change 8, dated 4 May 1990. Orange Paper E/91/1
RB211-Trent 772-60	
RB211-Trent 772B-60	
RB211-Trent 772C-60	

4.2 Special Conditions (SC)

Model	Special Conditions
RB211-Trent 768-60	SC1 Ingestion of Rain (E790) SC2 Ingestion of Hail (E790)
RB211-Trent 772-60	
RB211-Trent 772B-60	
RB211-Trent 772C-60	

4.3 Equivalent Safety Findings (ESF)

Model	Special Conditions
RB211-Trent 768-60	JAR-E 740(f): Non-Declaration or Display of Maximum Continuous Speed Limitations JAR-E 800(c): Number of Medium Birds (NPA-E-12 ref Orange Paper E/93/1)
RB211-Trent 772-60	
RB211-Trent 772B-60	
RB211-Trent 772C-60	

4.4 Deviations

Model	Special Conditions
RB211-Trent 768-60	JAR-E 570(a)(3): Scavenge pump inlet strainers – Exemption JAR-E 890(a): Engine Calibration in Reverse Thrust – Exemption
RB211-Trent 772-60	
RB211-Trent 772B-60	
RB211-Trent 772C-60	

4.5 Environmental Protection

Model	Special Conditions
RB211-Trent 768-60	CS-34 Amendment 4 as implemented by ED Decision 2021/011/R (applicable 25 July 2021), ICAO Annex 16 Volume II, Amendment 10 applicable 1 January 2021 as implemented into EU legislation 27 April 2021. NOx standard in accordance with ICAO Annex 16 Volume II, Part III, Chapter 2, § 2.3.2 e) (CAEP/8). Maximum nvPM mass concentration levels in compliance with Part III, Chapter 4, paragraph 4.2.2.1. nvPM mass and number emissions in compliance with Part III, Chapter 4, paragraph 4.2.2.2 a) 1) and 4.2.2.2 b) 1) (CAEP/11 In-Production standard). Compliance has also been demonstrated with the nvPM standard from ICAO Annex 16 Volume II, Amendment 10, Part III, Chapter 4, paragraph 4.2.2.2 a) 2) and 4.2.2.2 b) 2) (CAEP/11 New-Type standard).
RB211-Trent 772-60	
RB211-Trent 772B-60	
RB211-Trent 772C-60	

III. Technical Characteristics

1. Type Design Definition

The build standards are defined in the following Drawing Introduction Sheet (DIS) or later approved issues:

Model	Part Number
RB211-Trent 768-60	DIS 2150 Issue 3
RB211-Trent 772-60	DIS 2141 Issue 2
RB211-Trent 772B-60	DIS 2179 Issue 1
RB211-Trent 772C-60	DIS 2276 Issue 2

2. Description

Three shaft, high bypass ratio, axial flow, turbofan engine with Low Pressure (LP), Intermediate Pressure (IP) and High Pressure (HP) compressors driven by separate turbines through coaxial shafts. The LP compressor consists of 26-off wide chord fan blades. The combustion system consist of a single annular combustor, with 24-off fuel spray nozzles. The LP, IP and HP assemblies rotate independently, and in an anti-clockwise direction when viewed from the rear of the engine. The compressor and turbine have the following features:

Compressor	Turbine
LP – Single stage (fan)	LP – 4 stage
IP – 8 stage	IP – single stage
HP – 6 stage	HP – single stage

The engine control system utilises an Electronic Engine Controller (EEC) which has an airframe interface for digital communications (ARINC).

The engine Drawing Introduction Sheet (DIS) includes the Thrust Reverser Unit (TRU). All engines are approved for reverse thrust operation..

3. Equipment

The engine DIS includes the starter motor.

Refer to the appropriate engine DIS for details of equipment included in the engine type design and for details of equipment supplied by the aircraft Type Certificate (TC) holder.

4. Dimensions

Overall length, from tip of spinner minus rubber tip to rear of CNA: 5639 milimeters

Maximum radius, from centre line, not including drains mast: 1372 milimeters.

5. Dry Weight

Dry Engine Weight – kg	6160

Not including fluids and Nacelle EBU.

6. Ratings

	Thrust – kN (lbf)		
Models	**Take-off (net) (5 minutes)**	**Equivalent Bare Engine Take-off**	**Maximum Continuous (net)**
RB211-Trent 768-60	300.3 (67500)	304.3 (68400)	268.7 (60410)
RB211-Trent 772-60	316.3 (71100)	320.3 (72000)	282.7 (63560)
RB211-Trent 772B-60	316.3 (71100)	320.3 (72000)	282.7 (63560)
RB211-Trent 772C-60	316.3 (71100)	320.3 (72000)	282.7 (63560)

Refer to Notes 1, 2, 12, 13

7. Control System

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

EEC System, part number- EEC2000-04AS1 or later approved standard.

Software Standard:

RB211 Trent 768-60 and 772-60: EEC A6.2 (*)

RB211 Trent 772B-60: EEC A9.0 (*)

RB211 Trent 772C-60: EEC A12.5 (*)

(*) or later approved standard

Refer to Notes 3, 4.

8. Fluids (Fuel, Oil Coolant, Additives)

Fuel and Additives: Refer to the applicable engine “Operating Instructions” document F-Trent-A330, APPENDIX.

Oil: Refer to the “Civil Large Engines – Engine Oils Manual” document EOM-CIVIL-1RR.

9. Aircraft Accessory Drives

The engine’s accessory gearbox may be fitted with up to two hydraulic pumps and one Integrated Drive Generator to provide electrical and hydraulic power to the aircraft. These units are formally part of the airframe, and certified under JAR-25 regulations.

10. Maximum Permissible Air Bleed Extraction

Environmental control system bleed ('Customer Bleed') is bled from IP8 off take at take-off, cruise and climb, and from HP6 at descent and idle ground conditions. Switch-over from IP8 to HP6 off take takes place automatically, dependent upon engine and atmospheric conditions. The maximum allowable Customer Bleed is given in the tables below. Bleed flows vary linearly between the points listed.

Customer Bleed Off-takes for Normal Operation.

Condition	Customer Bleed (HP6) %W26	Customer Bleed (IP8) %W24
Low Idle	11.6%	n/a
Switchover point (nominal 1.26 EPR)	5.2%	4.5%
Maximum Continuous	n/a	3.1%
Above Max Continuous	n/a	2.4%

W24 is IP compressor inlet airflow and W26 is HP compressor inlet airflow.

Customer Bleed Off-takes for Abnormal Operation.

Condition	Customer Bleed (HP6) %W26	Customer Bleed (IP8) %W24
Low Idle	12.7%	n/a
Switchover point (nominal 1.26 EPR)	5.8%	5,3%
Maximum Continuous	n/a	4.0%
Above Max Continuous	n/a	2.9%

W24 is IP compressor inlet airflow and W26 is HP compressor inlet airflow.

Nacelle Thermal Anti-Icing Bleed Off-takes for Normal and Abnormal Operations:

Nacelle thermal anti-icing bleed is bled from HP3 offtake at all conditions. The nacelle thermal anti-icing flow demand is modulated via a regulating valve to provide a flow function to the engine / nacelle. The maximum allowable nacelle thermal anti-icing flow is given in the tables below. Bleed flows vary linearly between the points listed

TET (T41) °K	Nacelle Thermal Anti-Ice Bleed (HP3) %W26
Low Idle to 1450	0.75%
Maximum Continuous	0.69%
Above Maximum Continuous	0.44%

W26 is HP compressor inlet airflow

Fan bleed.

Fan bleed is taken off the fan outlet to cool the air in the cabin bleed system pre-cooler. The maximum allowable pre-cooler flows are given in the table below. Bleed flows vary linearly between the points listed.

Pre-cooler flow for normal and abnormal operation

Condition	Pre-cooler Bleed (LPC) %W120
Low Idle	1.23%
Maximum Continuous	1.23%
Above Maximum Continuous	0.96%

W120 is Fan inlet flow

IV. Operating Limitations

1. Temperature Limits

1.1. Climatic Operating Envelope

The engine may be used in ambient temperatures up to ISA+40°C. Refer to the applicable engine Installation Manual for details of the Operating Envelope, including the air inlet distortion at the engine inlet.

1.2. Turbine Gas Temperature (TGT) - Trimmed

Maximum TGT (°C)	
Below 50% HP speed, maximum during starts on the ground	700
Maximum during relights in flight	850
Maximum for take-off (5 min. limit)	900
Maximum Continuous (unrestricted duration)	850
Maximum over-temperature (See note 5)	920

Refer to Notes 5, and 6

1.3. Fuel Temperature

Fuel Temperature (°C)	
Minimum In flight	minus 54 (or the fuel freeze point, whichever is higher)
Minimum for ground starting	minus 54
Maximum fuel temperature	55

Refer to Note 7.

1.4. Oil Temperature

Combined Oil Scavenge Temperature (°C)	
Minimum for engine starting	minus 40
Minimum for acceleration to power	50
Maximum for unrestricted use	190

2. Pressure Limits

2.1. Fuel Pressure

Fuel Pressure - kPa		
Minimum absolute inlet pressure (measured at engine inlet)		34.5 + Fuel Vapour Pressure
Maximum pressure at inlet (measured at the pylon interface)		
(i)	Continuous	414
(ii)	Transiently	483
(iii)	Static	1276

2.2. Oil Pressure

Minimum oil pressure:

Oil Pressure– kPa		
Minimum oil pressure		
(i)	Ground idle to 70% HP rpm	165
(ii)	Above 95% HP rpm	345

3. Rotational Speed Limits (rpm).

Maximum Permissible Rotor Speeds (rpm)	**LP Rotor (N1)**	**IP Rotor (N2)**	**HP Rotor (N3)**
Reference speeds, 100% rpm	3900	7000	10611
Maximum for Take-off (5 minute limit)- Refer to Notes 2,8,9	99.0%	103.3%	100.0%
Maximum Over-speed (20-second limit) – Refer to Notes 8,9	99.0%	103.3%	100.0%
Maximum Continuous Refer to Notes 10, 9	98.2%	100.8%	99.1%

Stabilised operation in the speed range 51% to 74% N1 is not permitted during static operations. Passing through this speed range while increasing or decreasing thrust is permitted.

4. Installation Assumptions

Refer to Installation Manual for details.

5. Time Limited Dispatch

The engine has been approved for Time Limited Dispatch. The maximum justifiable rectification period for each dispatchable state is specified in the Installation Manual; no extension to such rectification period is allowed.

V. Operating and Service Instructions

Manuals All	**All Trent 700 engine models**
Installation Manual	EL2837
Operating Instructions	F-Trent-A330
Instructions for Continued Airworthiness (ICA)	**All Trent 700 engine models**
Engine Manual	E-Trent-A330
Time Limits Manual	T-Trent-1RR
Maintenance Manual	M-Trent-A330
Civil Large Engines – Engine Oils Manual	EOM-CIVIL-1RR
Service Bulletins	RB211—as published by TC holder

VI. Notes

1. The Equivalent Bare Engine Take-off Thrust quoted in the Ratings table is derived from the approved Net Take-off Thrust by excluding the losses attributable to the inlet, cold nozzle, hot nozzle, by-pass duct flow and leakage and the after body. No bleed or power offtakes are assumed.

2. The take-off rating and the associated operating limitations may be used for up to 10 minutes in the event of an engine failure, but their use is otherwise limited to no more than 5 minutes.

3. The software of the EEC is designated Level "1" according to DO-178A/ED-12A.

4. EMI / Lightning: Refer to applicable "Installation Manual" document for details.

5. The Trent 700 is approved for a maximum exhaust gas over-temperature of 920 °C for inadvertent use for periods of up to 20 seconds without requiring maintenance action. The cause of the over-temperature must be investigated and corrected.

6. Turbine Gas Temperature is measured by thermocouples positioned at the 1st stage Nozzle Guide Vane of the LP Turbine.

7. The fuel temperature limits are quoted for conditions at the engine inlet.

8. Post Modification 73-C780, the Maximum Take-Off speeds for LP and HP shafts are increased to 99.5% and 100.7%. The speed signals transmitted to the aircraft, however, are trimmed in order to maintain the same cockpit indicated Maximum Take-Off speeds as the pre-modification standard (i.e. 99.0% and 100.0% respectively.)

9. Post Modification 73-E502, the Maximum Take-Off speeds for the HP shaft is increased to 101.7%. The speed signals transmitted to the aircraft, however, are trimmed in order to maintain the same cockpit indicated Maximum Take-Off speeds as the pre-modification standard (i.e 100.0%). The Maximum Continuous HP Shaft speed is also raised from 99.1% to 100.1%.

10. The Maximum Continuous Speed limitations defined in this Data Sheet are not displayed as limitations on the A330 flight deck. Non display of these limitations was agreed during the Certification programme.

11. Models RB211 Trent 768-60, RB211 Trent 772-60 and RB211 Trent 772B-60 were previously certified under CAA-UK Engine Type Certificate 092/2 and Type Certificate Data Sheet 1050 prior to being superseded by the EASA Type Certificate and Type Certificate Data Sheet.

12. The RB211 Trent 772B-60 has the same ratings as the RB211 Trent 772-60 except between 610 m (2000 ft) and 2440 m (8000 ft) altitude or when the ambient temperature is greater than ISA+15°C where the 772B-60 produces increased thrust at take-off rating. The magnitude of this increase varies with altitude and ambient temperature and is limited to a maximum of 5.4%.

13. The RB211 Trent 772C-60 has the same ratings as the RB211 Trent 772B-60 except at altitudes above2440 m (8000 ft) where the 772C can provide more thrust in both Take-Off and Continuous conditions. The extent of this thrust increase is dependent upon altitude, temperature and Mach number, but is limited to a maximum of 8.5%. From 3048 m (10000 ft) to 4877 m (16000 ft) there is a Take-Off thrust increase of 3% for day temperatures of ISA+28°C and above, this reduces to 0% at ISA+8°C and below. At altitudes greater than 3962 m (13000 ft) and Mach numbers greater than 0.4 a further thrust increase results from maximum continuous thrust exceeding maximum Take-Off thrust, this increases the maximum Take-Off thrust below ISA+15°C by a maximum of 5.0% relative to the Trent 772B-60 at 4877 m (16000 ft), 0.5 Mn. Max Continuous thrust is increased by up to 8.5% relative to the Trent 772B-60 rating for altitudes between 4572 m (15000 ft) and 7620 m (25000 ft) for Mach numbers between 0.3 and 0.6 and temperatures from ISA to ISA+30°C.

14. The EASA approved Airworthiness Limitations Section of the Instructions for Continued Airworthiness is published in the applicable "Time Limits Manual".

Section 3 Administration

I. Acronyms and Abbreviations

Acronym / Abbreviation	Definition
ARINC	Aeronautical Radio, Incorporated
CNA	Common Nozzle Assembly
DIS	Drawing Introduction Sheet
EASA	European Union Aviation Safety Agency
EBU	Engine Build Unit
EEC	Engine Electronic Controller
EMI	Electro Magnetic Interference
FADEC	Full Authority Digital Engine Control
HP	High Pressure
ICAO	International Civil Aviation Organisation
IP	Intermediate Pressure
LP	Low Pressure
rpm	Revolutions per Minute
SC	Special Conditions
TCDS	Type Certificate Data Sheet
CAA	Civil Aviation Authority

II. Type Certificate Holder Record

TCH Record	Period
Rolls-Royce plc 62 Buckingham Gate Westminster London SW1E 6AT United Kingdom Design Organisation Approval No.: EASA.21J.035	From 24 January 1994 to 20 February 2019
Rolls-Royce Deutschland Ltd & Co KG Eschenweg 11 Dahlewitz 15827 Blankenfelde-Mahlow Germany Design Organisation Approval No.: EASA.21J.065	From 21 February 2019

III. Amendment Record

TCDS Issue No.	TCDS Issue Date	Changes	TC Issue and Date
1	23 Dec 2022	- Section 1 is added to provide explanatory notes about the details of the type design that affect the TCDS, that have been approved or accepted by the CAA in the UK from 01 January 2021 and that the design changes accepted by EASA before 01 January 2021 were incorporated into EASA TCDS EASA.E.042 at Issue 06 dated 20 December 2019 were therefore accepted by the UK under Article 15 of Annex 30 of the UK-EU Trade and Cooperation Agreement. - Section 2 (II) (1), (2), (3), and (4) added to provide information about certifying authority and certification basis applied by the certificating authority. - Section 2 (II) (4.5) updated with regards to the certification basis for environmental protection, in accordance with EASA Major Change certificate 10080323 dated 10 October 2022.	Issue 1 23 Dec 2022

– END –