TYPE-CERTIFICATE DATA SHEET

No. EASA E.047

for
RB211 Trent 800 series engines

Type Certificate Holder
Rolls-Royce Deutschland Ltd & Co KG
Eschenweg 11
Dahlewitz
15827 Blankenfelde-Mahlow
Germany

For Models:

RB211 Trent 895-17
RB211 Trent 892-17
RB211 Trent 892B-17
RB211 Trent 884-17
RB211 Trent 884B-17
RB211 Trent 877-17
RB211 Trent 875-17

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I. General

1. Type/ Model

RB211 Trent 895-17, 892-17, 892B-17, 884-17, 884B-17, 877-17 and 875-17 engines.

These models are approved for use on multi-engined civil aircraft classified in the Transport Category (Passenger) 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

DOA ref.: EASA.21J.065

formerly (until 20 February 2019):
Rolls-Royce plc
62 Buckingham Gate
Westminster
London
SW1E 6AT
United Kingdom

former Design Organisation Approval No.: EASA.21J.035

3. Manufacturer

Rolls-Royce plc

4. Date of Application

2 April 1992

5. Certification Reference Date

2 April 1992

6. EASA Type Certification Date

27 January 1995	13 November 1996	16 April 1997	22 June 1999	26 November 1999
884-17 877-17 875-17	892-17	892B-17	895-17	884B-17

(See Note 1).

II. Certification Basis

1. EASA Certification Basis

1.1. Airworthiness Standards

JAR-E Change 8, dated 4 May 1990
Orange Paper E/91/1

1.2. Special Conditions (SC)

JAR-E 790	Ingestion of Rain
JAR-E 790	Ingestion of Hail
JAR-E 800	Medium & Large Bird Ingestion

1.3. Equivalent Safety Findings

JAR-E 740(f) Speed Limitations at Maximum Continuous Rating (*see Note 4*).

1.4. Deviations

JAR-E890(a)	Engine Calibration in Reverse Thrust - Exemption
JAR-E 570(a)(3)	Scavenge pump inlet strainers – Exemption

1.5. Environmental Protection

Initial approval:

ICAO Annex 16 Volume II (1st edition 1981) models:	875-17, 877-17, 884-17, 884B-17, 892-17, 892B-17
ICAO Annex 16 Volume II (2nd edition 1993) model:	895-17

Approved 14 Dec 2012:
EASA CS-34 Issue dated 17.10.2003
ICAO Annex 16, Volume II (Third Edition, including Amendment 7),
for NOx: NOx Standard in accordance with Part III, Chapter 2, § 2.3.2, d) (CAEP/6)

III. Technical Characteristics

1. Type Design Definition

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

DIS 2175 Issue 1 for Trent 895-17
DIS 2184 Issue 2 for Trent 892-17
DIS 2185 Issue 1 for Trent 892B-17
DIS 2151 Issue 3 for Trent 884-17
DIS 2219 Issue 1 for Trent 884B-17
DIS 2158 Issue 3 for Trent 877-17
DIS 2157 Issue 3 for Trent 875-17

2. Description

The Trent 800 engine is a three shaft high bypass ratio, axial flow, turbo-fan with Low Pressure, Intermediate Pressure and High Pressure Compressors driven by separate turbines through coaxial shafts. The engine has a by-pass ratio of 6.4:1 at a typical cruise thrust.
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 – 5 stage, axial flow
IP – 8 stage, axial flow	IP – Single Stage, axial flow
HP – 6 stage, axial flow	HP – Single Stage, axial flow

The combustion system consists of a single annular combustor liner with 24 fuel nozzles.

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

Pressure Ratio:

Engine model	895-17	892-17	892B-17	884-17	884B-17	877-17	875-17
Nominal overall Pressure Ratio at Sea Level ISA Conditions	40.7 : 1	39.6 : 1		37.5 : 1		34.7 : 1	33.9 : 1

3. Equipment

For details of equipment included in the type design definition, refer to the Installation Manual.
For details of equipment supplied by the Airframe TC holder, refer to the Installation Manual.
The starter is included in the Engine type design.
The Thrust Reverser Unit does not form part of the engine type design. (see Note 3)

4. Dimensions

Overall Length (mm)	4568 *(178 inch)*
Maximum Radius (mm)	1524 *(60 inch)*

5. Dry Weight

Dry engine weight (kg)	6078 (*13400 lbs*)

6. Ratings

The ISA sea-level static thrust ratings are:

Rating		**895-17**	**892-17**	**892B-17**	**884-17**	**884B-17**	**877-17**	**875-17**
Thrust, kN (*lbf*)	Take-off (net) (5 minutes)	413.4 *(92,940)*	406.8 *(91,450)*		380.0 *(85,430)*		351.0 *(78,910)*	340.6 *(76,580)*
	Equivalent Bare Engine Take-off	419.6 *(94,320)*	412.8 *(92,800)*		385.6 *(86,700)*		356.3 *(80,110)*	345.9 *(77,750)*
	Maximum Continuous (net)	343.3 *(77,170)*	343.3 *(77,170)*		312.3 *(70,210)*		312.3 *(70,210)*	276.5 *(62,160)*

See Notes 5, 6 & 7.

7. Control System

The engines are equipped with an EEC (*Electronic Engine Control*) in which the software is designated Level 1 according to DO-178A/ED-12A.

Refer to the Installation Manual and Operating Instructions for further information.

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

8.1 Fuel and Additives

Refer to the Operating Instructions manual for information on approved fuel and additive specifications.

8.2 Oil

Refer to the Operating Instructions manual for information on approved oil specifications.

9. Aircraft Accessory Drives

The loads, weights and power extractions are defined in the Installation Manual.

10. Compressor Air Bleed Extraction

Environmental Control System Bleed (*'Customer Bleed'*) is automatic scheduled from the engine IP stage 8 and HP stage 6 compressor bleed ports via two valves in the aircraft ducting which select the appropriate supply in response to signals sensing the HP compressor delivery pressure (*P30*), IP compressor delivery pressure (*P25*), altitude and corrected HP compressor speed.

Powerplant Anti-Icing Flow is bled from HP3 offtake at all conditions.

The maximum allowable bleed flow is given in the tables below. (*The bleed flow varies linearly between the points listed, W24 is intermediate Compressor inlet flow, W120 is fan inlet flow*):

Customer Bleed Off takes for normal operation

Condition	MAX CUSTOMER BLEED HP6 (%W26)	MAX CUSTOMER BLEED IP8 (%W24)
Low Idle (*and up to 1230 TET*)	11.5	-
Switchover point	5.4	5.0
Maximum Continuous	-	5.0
Take-off	-	2.2

Customer Bleed Off takes for abnormal (One Engine Inoperative) operation

Condition	MAX CUSTOMER BLEED HP6 (*%W26*)	MAX CUSTOMER BLEED IP8 (*%W24*)
Low Idle (*and up to 1465 TET*)	11.5	-
Switchover point	7.3	6.0
Maximum Continuous	-	6.0
Take-off	-	3.4

Maximum Nacelle Thermal Anti-Icing Bleed Off takes for normal and abnormal operation

TET (*T41*) K	NACELLE THERMAL ANTI-ICE BLEED (*HP3*) %W26
Low Idle and up to 1050	0.63
Maximum Continuous	linear decrease between 0.63 and 0.57
Take-off	0.57

Pre-cooler flow for normal and abnormal operation

Condition	Max LP BLEED (LPC) %W120 (fan inlet flow)
Low Idle	0.8
Maximum Continuous	0.8
Take-off	0.8

IV. Operating Limitations

1. Climatic Operating Envelope

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

Engine model		**892-17**	**884-17**	**884B-17**	**875-17**
Rating	**Flat rated at**	**ISA**	**ISA**	**ISA**	**ISA**
Take-off (*5 minutes*)	**all altitudes**	**+15°C**			
Maximum Continuous	**all altitudes**	**+10°C**			

Engine model		**895-17**
Rating	**Flat rated between**	**ISA**
Take-off (*5 minutes*)	**-610m and 139m** *(-2000 ft and +457 ft)*	**+10°C**
	139m and 457m *(457 ft and 1500 ft)*	**linearly between +10°C and +9°C**
	457m and 610m *(1500 ft and 2000 ft)*	**linearly between +9°C and +10°C**
	610m and 1219m *(2000 ft and 4000 ft)*	**linearly between +10°C and +5°C**
	1219m and 1829m *(4000 ft and 6000 ft)*	**+5°C**
	1829m and 1996m *(6000 ft and 6550 ft)*	**linearly between +5°C and +10°C**
	1996m and 3048m *(6550 ft and 10000 ft)*)	**+10°C**
	3048m and 3658m *(10000 ft and 12000 ft*)	**linearly between +10°C and +15°C**
	3658m and above *(12000 ft and above)*	**+15°C**
Maximum Continuous	**all altitudes**	**+10°C**

Engine model		**877-17**
Rating	**Flat rated between**	**ISA**
Take –Off (*5 minutes*)	**-610m and +610m** *(-2000 ft and 2000 ft)*	**+22.8°C**
	610m and +1524m *(2000 ft and 5000 ft)*	**linearly between +22.8°C and +15°C**
	1524m and above *(5000 ft and above)*	**+15°C**
Max Continuous	all altitudes	**+10°C**

Engine model		**892B-17**
Rating	**Flat rated between**	**ISA**
Take-off (*5 minutes*)	**-610m and +610m** *(-2000 ft and +2000 ft)*	**+15°C**
	610m and 1372m *(2000 ft and 4500 ft)*	**linearly between +15°C and +4°C**
	1387m and 1996m (*4550 ft and 6550 ft*)	**linearly between +4°C and +8°C**
	1996m and 2438m *(6550 ft and 8000ft)*	**linearly between +8°C and +15°C**
	2438m and above *(8000 ft and above)*	**+15°C**
Maximum Continuous	**all altitudes**	**+10°C**

2. Temperature Limits

2.1 Turbine Gas Temperature (°C)

Maximum during starts or relights:	700
Maximum for take-off (*5 min. limit*):	900
Maximum Continuous (*unrestricted duration*):	850
Maximum over-temperature (*20 second limit*):	920

2.2 Oil (*combined scavenge*) Temperature (°C)

Minimum for engine starting:	-40
Minimum for opening up:	50
Maximum for unrestricted use:	191

2.3 Fuel Temperature (°C)

Minimum fuel temperature: -54 or freezing point, *(whichever is higher)*

Maximum fuel temperature at outlet from HP Fuel pump:

(i) Unrestricted 140

(ii) Maximum during transient overshoots on reducing RPM (*15 min. limit*) 165

3. Maximum Permissible Rotor Speeds:

		HP	IP	LP
Reference speeds, 100% rpm (*rpm*)		10611	7000	3300
Maximum for Take-off % (5 minute limit) See Note 8	Pre-mod 72-B672	100.5	105.0	100.5
	Post-mod 72-B672	102.5		
Maximum Continuous % See Note 4	Pre-mod 72-B672	-	-	-
	Post-mod 72-B672	-		
Maximum for reverse thrust (33 second limit) %		-	-	80.5
Maximum Overspeed	Pre-mod 72-B672	100.9	107.0	101.2
	Post-mod 72-B672	102.8	107.0	101.2

4. Pressure Limits

4.1 Fuel Pressure Limits (*kPa*)

(i) Maximum gauge pressure at engine inlet (*measured at inlet to LP fuel pump*):

Continuous	414 (*60 psi*)
Transiently	483 (*70 psi*)
Static	1172 (*170 psi*)

(ii) Minimum absolute inlet pressure (*measured at engine inlet LP Fuel pump*)	34 (*5 psi*)+ true inlet Vapour Pressure

Operation with aircraft boost pumps inoperative, kerosene fuel types only:

For engine operation with the aircraft boost pumps inoperative the engine minimum fuel pressure limit is reduced down to 7.6 kPa (1.1 psi) at altitudes of up to 13,140 m (43,100 ft) for up to 750 minutes when operated with approved kerosene fuels.
Refer to the Installation Manual for additional information.

4.2 Oil Pressure Limits (*kPa*)

Minimum acceptance for flight:	
Ground idle to 70% HP rpm	241.0 (*35 psi*)
Above 95% HP rpm	414.0 (*60 psi*)
Minimum to complete flight:	
Ground idle to 70% HP rpm	172.0 (*25 psi*)
Above 95% HP rpm	345.0 (*50 psi*)

4.3 Oil Capacity (*l*)

Nominal total oil system capacity	44.5 (*78.2 Imp pt*)
Nominal oil tank capacity	23.3 (*41.0 Imp pt*)
Usable oil (including effect of attitude) minimum	15.4 (*27.1 Imp pt*)

4.4 Maximum allowable Oil Consumption (*l/hr*):

Overall inflight, maximum for unrestricted operation	0.66 (*1.17 Imp pt/hr*)

5. Installation Assumptions

Refer to Installation Manual for details.

6. 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

Document	Trent 800 all Models
Installation Manual	EL 2839
Operating Instructions	F-Trent-777
Engine Manual	E-Trent-2RR
Maintenance Manual	D633W101-RRY
Time Limits Manual	T-Trent-2RR
Service Bulletins	various

VI. Notes

1. The models of RB211 Trent 800 were previously covered under CAA-UK Engine Type certificate 093/4 and Type Certificate Data Sheet 1051 prior to being superseded by the EASA Type Certificate and Type Certificate Data Sheet.

2. The RB211 Trent 800 series engines have been approved to operate with certain faults present in the control system. The dispatch criteria for the control system are specified in Rolls-Royce PLC report DNS 14049.

3. The Trent 800 series engines are approved for use with Boeing Thrust reverser Part no. 315W5000-1/-2.

4. The Maximum rotor speeds demonstrated at Maximum Continuous conditions are 98.8% for HP (Pre-mod 72-B672), 99.9% for HP (post mod 72.B672), 102,8% for IP, 98.5% for LP. In accordance with the equivalent safety findings made against JA-E740, these speeds are not required to be displayed as operating limitations.

5. 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.

6. The 892B-17 engine's rated Take-off Thrust is identical to the 892-17 engine at ISA Sea Level Static conditions and most other conditions except that the 892B-17 engine's rating provides increased thrust for take-off at altitudes between 610m and 2438m (*2000 and 8000 ft*). The magnitude of this increased thrust varies with altitude, Mach number and ambient temperature and is limited to a maximum of 5.2%.

7. The 884B-17 Maximum Continuous thrust is as the 884-17 rating up to 3658m (*12000 ft*), increasing linearly to be as the 892-17 maximum continuous thrust at 7620m (*25000 ft*) and above.

8. The Take-off rating and its associated operating limitations may be used for up to 10 minutes in the event of engine failure, but is otherwise limited to not more than 5 minutes.

9. The Trent 890-17 engine was redesignated as the Trent 892-17 on 13 November 1996.

SECTION: ADMINISTRATIVE

I. Acronyms and Abbreviations

EASA	European Union Aviation Safety Agency
EBAS	Environmental Bleed Air System
EEC	Electronic Engine Control
ETOPS	Extended Time Operations
DIS	Drawing Introduction Sheet
HP	High Pressure
ICAO	International Civil Aviation Organisation
IP	Intermediate Pressure
LP	Low Pressure
NAI	Nacelle Anti-Icing
rpm	Revolutions per Minute
SC	Special Conditions
TCDS	Type Certificate Data Sheet
TET	Turbine Entry Temperature
W26	Air Mass Flow HPC entry (location 26)

II. Type Certificate Holder Record

Rolls-Royce Deutschland Ltd & Co KG

formerly (until 20 February 2019): Rolls-Royce plc

III. Change Record

Issue	Date	Changes	TC issue date
Issue 01	24 June 2013	Initial Issue	Initial Issue, 24 June 2013
Issue 02	10 October 2013	Editorial updates	
Issue 03	23 March 2018	Change of TC Holder's address	23 March 2018
Issue 04	21 February 2019	Transfer of TC from Rolls-Royce plc to Rolls-Royce Deutschland Ltd & Co KG	21 February 2019

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